

حمل الآن

مجاناً وحصرياً

# المراجعة رقم (1)

اختبار شهر اكتوبر



# Questions

## Unit 1 | Lesson 1

Answered

## Hydrosphere on Planet Earth

Interactive  
test



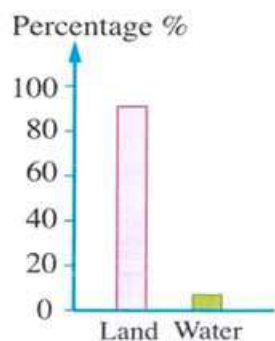
First

Multiple Choice Questions

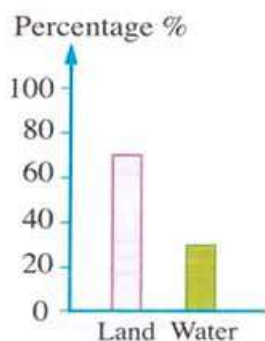
Questions signed by \* are answered in detail.

### Hydrosphere

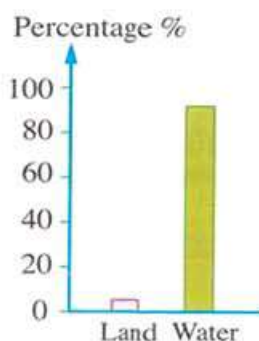
- 1 Which of the following **doesn't** represent an ecosystem?
  - (a) The great desert.
  - (b) Amazon rainforest.
  - (c) Atmosphere.
  - (d) Salty lakes.
- 2 The ratio of frozen water to liquid fresh water on the planet Earth is .....
  - (a)  $\frac{1}{2}$
  - (b)  $\frac{2}{1}$
  - (c)  $\frac{3}{1}$
  - (d)  $\frac{1}{1}$
- 3 What is the direct source of fresh water on the Earth's surface?
  - (a) Oceans.
  - (b) Seas.
  - (c) Salty lakes.
  - (d) Rivers.
- 4 What are the states of matter at which water exists in the spheres of planet Earth?
  - (a) Solid and liquid only.
  - (b) Solid, liquid and gaseous.
  - (c) Solid and gaseous only.
  - (d) Liquid and gaseous only.
- 5 What is the percentage that oceans, seas and salty lakes represent from the total percentage of water covering the Earth?
  - (a) 70%
  - (b) 97%
  - (c) 3%
  - (d) 30%
- 6 Which of the following represents the largest source of water on the Earth's surface?
  - (a) Oceans.
  - (b) Fresh lakes.
  - (c) Groundwater.
  - (d) Glaciated rivers.
- 7 Which of the following graphs represents the percentage of water and the percentage of land on the Earth's surface?



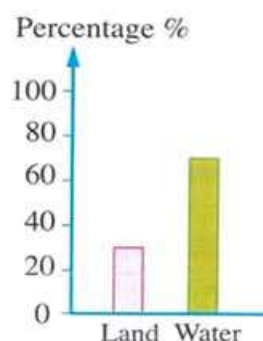
(a)



(b)

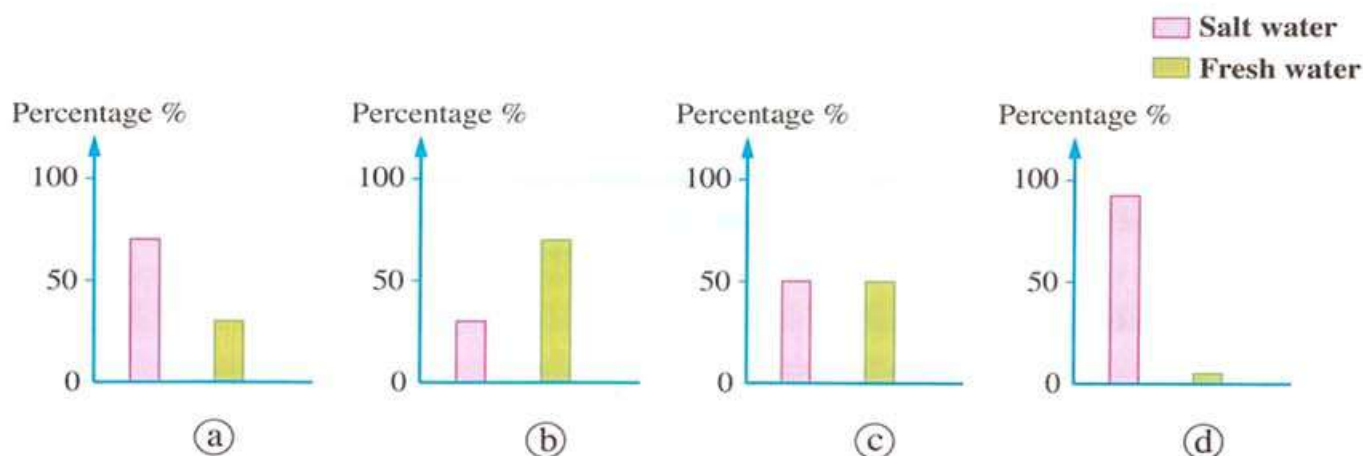


(c)



(d)

- 8 Which of the following graphs represents the water distribution approximately in the hydrosphere of Earth?



### Water cycle in nature

- 9 Transpiration and respiration are vital processes that contribute to the hydrological cycle. Which choice in the following table correctly represents them?

|     | Transpiration occurs in | Respiration occurs in |
|-----|-------------------------|-----------------------|
| (a) | Plants only             | Plants and animals    |
| (b) | Plants only             | Animals only          |
| (c) | Plants and animals      | Plants and animals    |
| (d) | Animals only            | Plants and animals    |

- 10 Which of the following processes may be a direct source of groundwater?

- (a) Water evaporation. (b) Respiration in human.  
(c) Transpiration in plants. (d) Infiltration.

- 11 The water cycle in nature is known as ..... cycle.

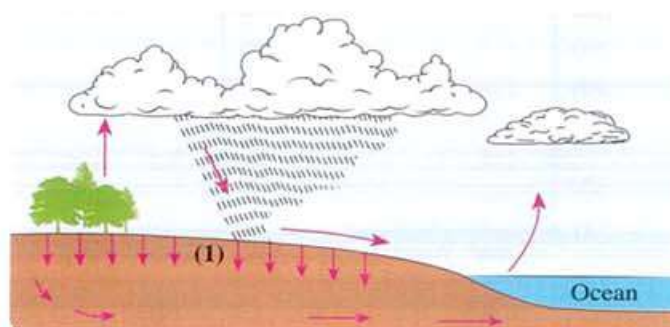
- (a) hydrogen (b) geological (c) biological (d) hydrological

- 12 How does water return directly from land to oceans?

- (a) By evaporation. (b) By flowing.  
(c) By condensation. (d) By volatility.

- 13 The opposite figure represents a part of the water cycle in nature. So, process no. (1) participates in .....

- (a) rain falling  
(b) groundwater formation  
(c) clouds formation  
(d) snow falling





- 14 What is the direct role of transpiration process in the hydrological cycle?  
 (a) Infiltration through sedimentary rocks.  
 (b) Condensation of water vapor forming clouds.  
 (c) Increasing CO<sub>2</sub> gas percentage in the atmosphere.  
 (d) Increasing the water vapor percentage in the atmosphere.
- 15 \* Which of the following statements isn't applied to the water cycle in nature?  
 (a) It includes water movement through many pathways.  
 (b) Living organisms have a role in its continuity.  
 (c) It keeps the constancy of the Earth's surface.  
 (d) It represents a nearly closed system.
- 16 \* What is the process that occurs to the output of transpiration during the hydrological cycle?  
 (a) Evaporation. (b) Infiltration. (c) Falling. (d) Condensation.
- 17 Stomata are present in .....  
 (a) roots (b) leaves (c) flowers (d) fruits
- 18 What is the biological process that the animals perform and share through it in the water cycle in nature?  
 (a) Respiration. (b) Transpiration. (c) Photosynthesis. (d) Growth.
- 19 \* Which of the following processes is opposite to the condensation process in the water cycle in nature?  
 (a) Water infiltration through the soil pores.  
 (b) Evaporation from water bodies.  
 (c) Rain falling.  
 (d) Ice melting.
- 20 Which of the following processes doesn't result in increasing the percentage of water vapor in the atmosphere?  
 (a) Transpiration in plants.  
 (b) Water infiltration through sedimentary rocks.  
 (c) Animals respiration.  
 (d) Seawater evaporation.
- 21 Which of the following isn't from the nitrogenous wastes?  
 (a) Ammonia. (b) Nitrogen gas. (c) Urea. (d) Uric acid.
- 22 As the number of plant leaves increases, the rate of transpiration .....  
 (a) increases (b) decreases (c) vanishes (d) isn't affected
- 23 Which of the following factors doesn't affect the transpiration process?  
 (a) Number of plant leaves. (b) Number of flowers and fruits.  
 (c) Soil humidity. (d) Atmospheric temperature.
- 24 In which of the following periods of time, the rate of transpiration increases during the day?  
 (a) At early morning. (b) At noon.  
 (c) At sunset. (d) At evening.



## Second

## Miscellaneous Questions

### 1 Write the scientific term for each of the following statements:

- Everything surrounds us including biotic components and abiotic components.
- A community of living organisms interacting with each other and with the other abiotic components.
- It is a nearly closed system that is able to change the Earth's surface physically, chemically and biologically through a continuous change among the three states of water.
- It is a process by which the plant gets rid of excess water in the form of vapor from its surface exposed to the air.
- Microscopic openings found on the surfaces of leaves and green stems, through which most transpiration occurs.
- A process by which living organisms get rid of the waste products resulting from the metabolic processes.

### 2 Give reasons for:

- The living organisms interact with each other and with the non-living components in the ecosystem.
- Ocean water is not suitable for direct use.
- Condensation has an important role in the water cycle in nature.
- Stomata have a role in adaptation of plant with the high atmospheric temperature.

### 3 What happens in each of the following cases:

- Water infiltration through the soil pores and sedimentary rocks.
- Plants perform the transpiration process, "**regarding:** the transportation process in plant".

### 4 Compare between each of the following:

- The biotic components and the abiotic components in the environment "**in terms of:** examples".
- Salt water and frozen water "**in terms of:** their percentage from the total water percentage on Earth".

### 5 Explain how clouds are formed and the importance of this process in water cycle.

### 6 The importance of transpiration is not limited on plant only. Explain this.

## Questions that measure high levels of thinking

Answered in detail

### Choose the correct answer:

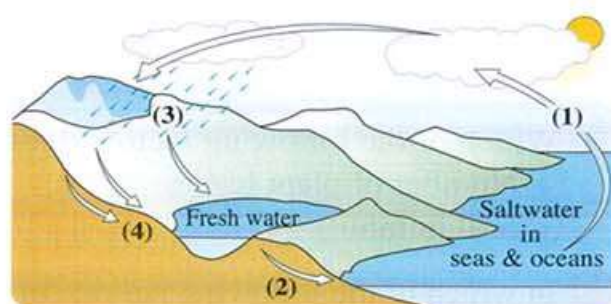
The opposite figure illustrates some processes in the water cycle in nature:

- (1) Which of the following processes directly precedes the condensation process?

- (1).
- (2).
- (3).
- (4).

- (2) Which of the following processes **doesn't** occur by the effect of gravity?

- (1).
- (2).
- (3).
- (4).





# Questions ?

## Unit 1 | Lesson 2

Answered

## Chemical Properties of Water

First

### Multiple Choice Questions

Questions signed by \* are answered in detail.

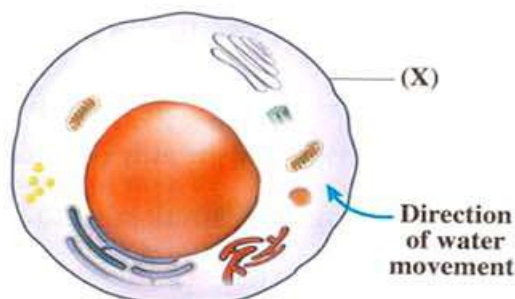
Interactive  
test



#### Chemical composition of water

- 1 The opposite figure represents an animal cell, what is the role of structure (X) on passing water through it in the direction illustrated in the figure?

- (a) Producing energy.
- (b) Allowing the passage of nutrients.
- (c) Allowing the passage of wastes.
- (d) Protecting the cell.



- 2 Which of the following **isn't** from the properties of water that support life?

- (a) Dissolving many chemical compounds.
- (b) Passing required substances to inside the cell.
- (c) Passing the wastes to outside the cell.
- (d) The difference in the mass of its elements.

- 3 The value of the angle between the two bonds in the water molecule is .....

- (a) 10.45°
- (b) 104.5°
- (c) 105.4°
- (d) 10.54°

- 4 Which of the following is correct about water molecule?

- (a) The ratio of hydrogen mass to oxygen mass is 1 : 2
- (b) The percentage of hydrogen mass represents 33.33%
- (c) The percentage of oxygen mass represents 88.89%
- (d) The external angle between the two hydrogen atoms represents 104.5°

- 5 Which of the following represents the mass percentages of each of hydrogen and oxygen respectively in a water sample?

- (a) 33.33% , 66.67%
- (b) 66.67% , 33.33%
- (c) 11.11% , 88.89%
- (d) 88.89% , 11.11%

- 6 What is the approximate ratio of oxygen mass to hydrogen mass in water molecule?

- (a)  $\frac{1}{8}$
- (b)  $\frac{1}{2}$
- (c)  $\frac{2}{1}$
- (d)  $\frac{8}{1}$



- 7 \* What is the mass of hydrogen in a sample of distilled water whose mass is 200 g?  
(a) 11.11 g                      (b) 22.22 g                      (c) 88.89 g                      (d) 177.78 g
- 8 The number of electrons shared by two hydrogen atoms to form covalent bonds in a water molecule .....  
(a) 1                      (b) 2                      (c) 3                      (d) 4

### Chemical properties of water

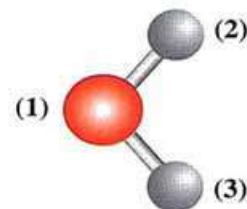
- 9 Which of the following is correct about the two elements that forming water molecule?  
(a) Oxygen is smaller in mass and greater in electronegativity.  
(b) Oxygen is greater in mass and less in electronegativity.  
(c) Hydrogen is greater in mass and higher in electronegativity.  
(d) Hydrogen is smaller in mass and less in electronegativity.
- 10 What is the type of bonds among water molecules?  
(a) Hydrogen bonds.                      (b) Single covalent bonds.  
(c) Ionic bonds.                      (d) Double covalent bonds.
- 11 The reason for the polarity of the water molecule is the difference in .....  
(a) electronegativity of its elements  
(b) the atomic mass of its elements  
(c) the number of covalent bonds between its atoms  
(d) the type of covalent bonds between its atoms
- 12 Water polarity causes .....  
(a) the dissolution of many substances in it                      (b) decreasing its density  
(c) its acidic effect                      (d) its basic effect
- 13 The maximum number of hydrogen bonds that each water molecule can form, equals .....  
(a) 1                      (b) 2                      (c) 3                      (d) 4
- 14 Hydrogen bond is originated among water molecules, due to the attraction between .....  
(a) oxygen atom in water molecule with oxygen atom in another water molecule  
(b) hydrogen atom in water molecule with hydrogen atom in another water molecule  
(c) oxygen atom in water molecule with hydrogen atom in another water molecule  
(d) oxygen atom with hydrogen atom in the same water molecule

15 What is the reason of the formation of hydrogen bonds among water molecules?

- (a) Volume of (O) atom > Volume of (H) atom.
- (b) Mass of (O) atom > Mass of (H) atom.
- (c) Density of (O) atom > Density of (H) atom.
- (d) Electronegativity of (O) atom > Electronegativity of (H) atom.

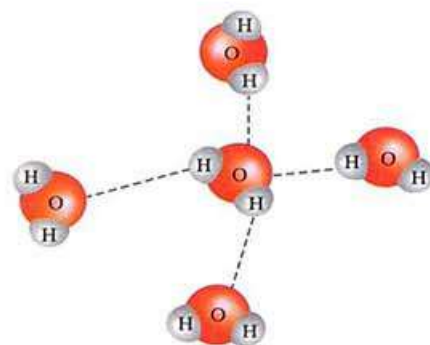
16 The opposite figure illustrates the structure of water molecule, which of the following atoms carry a partial positive charge?

- (a) (1) and (2).
- (b) (1) and (3).
- (c) (2) and (3).
- (d) (1), (2) and (3).



17 The opposite figure represents a number of water molecules. What is the number of hydrogen and covalent bonds respectively?

- (a) 4 , 10
- (b) 5 , 4
- (c) 4 , 5
- (d) 10 , 4



18 When comparing the boiling point of  $\text{H}_2\text{O}$  with the boiling point of  $\text{H}_2\text{S}$ , .....

- (a)  $\text{H}_2\text{O}$  is higher, as its molecules are bound by hydrogen bonds
- (b)  $\text{H}_2\text{S}$  is higher, as its molecules are bound by hydrogen bonds
- (c)  $\text{H}_2\text{O}$  is higher due to its small molecular mass
- (d)  $\text{H}_2\text{S}$  is higher due to its great molecular mass

19 Water resembles hydrogen sulphide in .....

- (a) molecular mass
- (b) the boiling point
- (c) the presence of hydrogen bonds
- (d) the molecule structure

20 \* On heating a sample of pure water till boiling, .....

- (a) the covalent bonds are broken and water molecules are released in the form of water vapor
- (b) the covalent bonds are broken and hydrogen atoms are separated from oxygen atoms
- (c) the hydrogen bonds are broken and water molecules are released in the form of water vapor
- (d) the hydrogen bonds are broken and hydrogen atoms are separated from oxygen atoms

21 \* At normal atmospheric pressure, the boiling point of pure water ( $\text{H}_2\text{O}$ ) is greater than that of hydrogen sulphide ( $\text{H}_2\text{S}$ ) by .....

- (a)  $100^\circ\text{C}$
- (b)  $-61^\circ\text{C}$
- (c)  $39^\circ\text{C}$
- (d)  $161^\circ\text{C}$



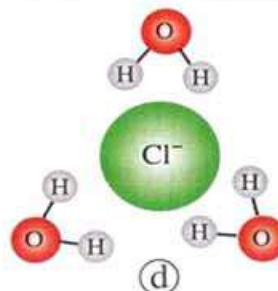
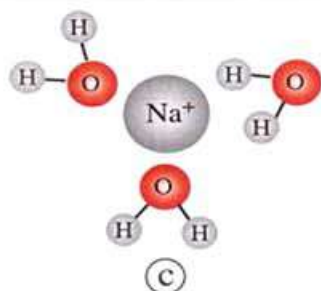
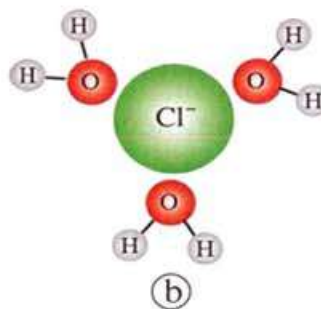
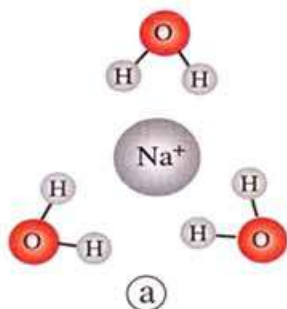
- 22 \* The boiling point of compound  $H_2X$  is less than that of compound  $H_2Y$ . Which of the following is correct?

|     | The electronegativity of element (X)              | The polarity of compound ( $H_2Y$ )              |
|-----|---------------------------------------------------|--------------------------------------------------|
| (a) | Greater than the electronegativity of element (Y) | Less than the polarity of compound ( $H_2X$ )    |
| (b) | Greater than the electronegativity of element (Y) | Greater than the polarity of compound ( $H_2X$ ) |
| (c) | Less than the electronegativity of element (Y)    | Less than the polarity of compound ( $H_2X$ )    |
| (d) | Less than the electronegativity of element (Y)    | Greater than the polarity of compound ( $H_2X$ ) |

- 23 Which of the following happens when sodium chloride salt is added to water?

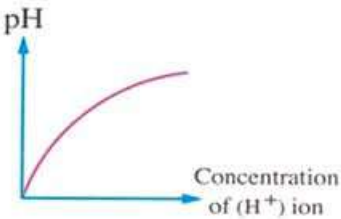
- (a) Positive ions bound to the positive pole of water.
- (b) Negative ions bound to the negative pole of water.
- (c) The crystal lattice of the salt dissociates.
- (d) Hydrolysis of salt ions.

- 24 Which of the following forms is correct when table salt is added to water?

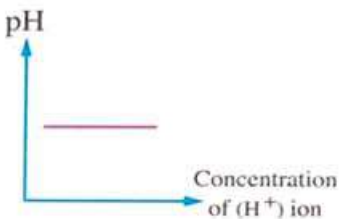


- 25 On dissolving ammonium chloride salt in water, .....

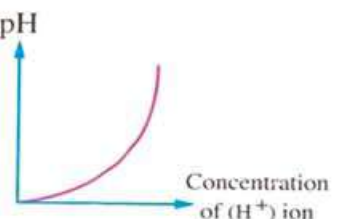
- (a) hydrolysis takes place and the solution becomes acidic
- (b) hydrolysis takes place and the solution becomes basic
- (c) the salt dissociates but no hydrolysis takes place
- (d) the salt doesn't dissociate and no hydrolysis takes place

- 26 \* Which of the following solutions has the highest pH value?  
 (a) Ammonium bicarbonate solution. (b) Acetic acid solution.  
 (c) Potassium bicarbonate solution. (d) Nitric acid solution.
- 27 On dissolving sodium bicarbonate salt in water, the solution becomes .....  
 (a) acidic (b) basic (c) neutral (d) amphoteric
- 28 Which of the following resulting from the dissolution of sodium bicarbonate in water?  
 (a) The concentration of  $(OH^-)$  ions decreases.  
 (b) The concentration of  $(H^+)$  ions increases.  
 (c) The pH value decreases. (d) The pH value increases.
- 29 When immersing the pH paper test tape in a sample of concentrated solution of NaOH, the tape color becomes .....  
 (a) red (b) orange (c) green (d) blue
- 30 When dissolving an unknown salt in water, it leads to a decrease in the concentration of  $(OH^-)$  ions in it. What is your conclusion about the nature of the unknown salt solution?  
 (a) Acidic. (b) Basic. (c) Neutral. (d) Amphoteric.
- 31 In which of the following salt solutions of equal concentration is the hydrogen ion concentration the highest?  
 (a) KCl (b)  $NH_4Cl$  (c)  $NH_4HCO_3$  (d)  $NaHCO_3$
- 32 The ratio between the concentration of hydrogen ions in a certain amount of pure water to the concentration of hydrogen ions after the dissolution of 10 g of ammonium chloride salt in this amount of water is .....  
 (a) greater than 1 (b) less than 1 (c) equal to 1 (d) equal to 7
- 33 Which of the following graphs illustrates the relation between the pH value of the solution and the concentration of  $(H^+)$  ions in it?
- 

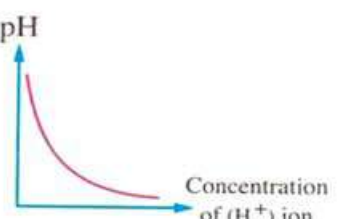
(a)



(b)



(c)



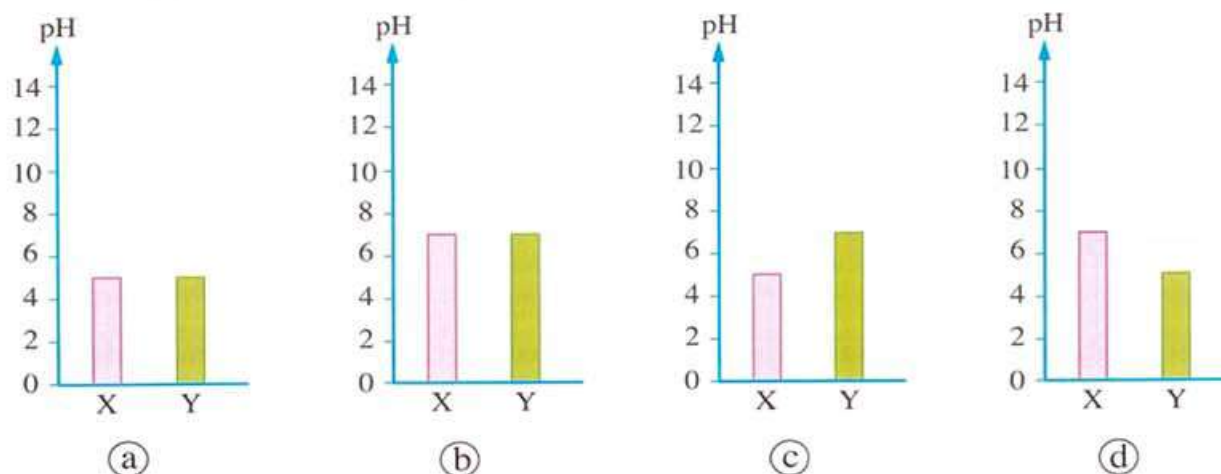
(d)
- 34 The solution at which the concentration of  $(H^+)$  ions is less than the concentration of  $(OH^-)$  ions is .....  
 (a) acidic solution and its pH value is less than 7  
 (b) acidic solution and its pH value is greater than 7  
 (c) basic solution and its pH value is less than 7  
 (d) basic solution and its pH value is greater than 7



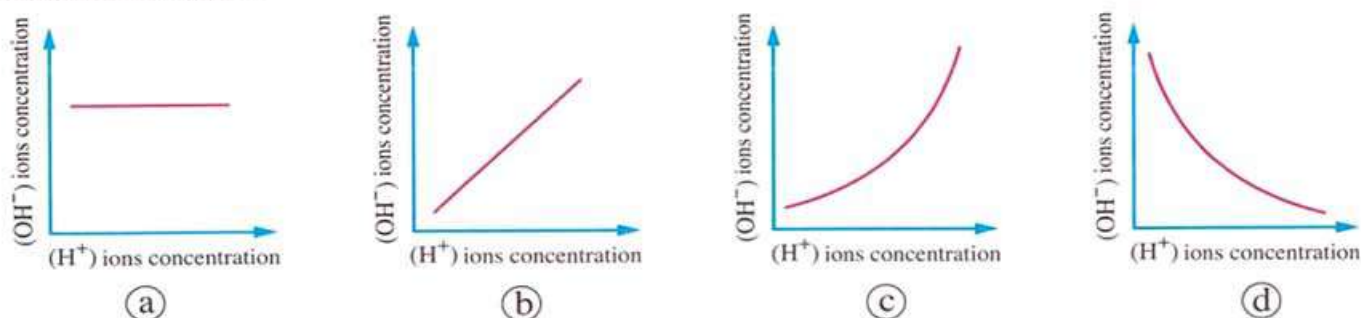
35 You have a solution of an unknown salt whose ( $\text{pH} = 5.3$ ). So, it is probable that the solution is for ..... salt.

- (a) sodium chloride (b) sodium bicarbonate  
(c) ammonium chloride (d) ammonium bicarbonate

36 Which of the following graphs represents the pH of a sample of ammonium bicarbonate solution (X) and another sample of ammonium chloride solution (Y)?



37 Which of the following graphs correctly expresses the relation between the concentration of each of ( $\text{OH}^-$ ) and ( $\text{H}^+$ ) ions with the continuous dissolution of excess ammonium chloride in water?



38 When dissolving potassium bicarbonate salt in a suitable amount of distilled water, the pH value of the solution increases as a result of .....

- (a) increasing the concentration of ( $\text{H}^+$ ) ions  
(b) increasing the concentration of ( $\text{OH}^-$ ) ions  
(c) decreasing the concentration of ( $\text{OH}^-$ ) ions  
(d) decreasing the concentration of each ( $\text{H}^+$ ) and ( $\text{OH}^-$ ) ions

39 \* The ratio between ( $\text{H}^+$ ) ions concentration in an acidic solution to their concentration in an alkaline solution is .....

- (a) greater than 1 (b) equals 1  
(c) less than 1 (d) equals 7

40 If the pH value of a solution is 12.5, then the solution may be .....

- (a) hydrochloric acid (b) ammonium bicarbonate  
(c) pure water (d) sodium hydroxide

41 \* Which of the following expresses the ratio between the concentration of ( $H^+$ ) ions and ( $OH^-$ ) ions respectively in each of pure water and ammonium bicarbonate solution?

|     | Pure water | Ammonium bicarbonate solution |
|-----|------------|-------------------------------|
| (a) | 1 : 1      | 1 : 2                         |
| (b) | 2 : 1      | 1 : 1                         |
| (c) | 2 : 1      | 2 : 1                         |
| (d) | 1 : 1      | 1 : 1                         |

42 Which of the following expresses the relation between the concentration of ( $OH^-$ ) ions and ( $H^+$ ) ions in each of ammonium chloride solution and sodium bicarbonate solution?

|     | Ammonium chloride solution | Sodium bicarbonate solution |
|-----|----------------------------|-----------------------------|
| (a) | $(OH^-) > (H^+)$           | $(OH^-) < (H^+)$            |
| (b) | $(OH^-) < (H^+)$           | $(OH^-) > (H^+)$            |
| (c) | $(OH^-) > (H^+)$           | $(OH^-) = (H^+)$            |
| (d) | $(OH^-) = (H^+)$           | $(OH^-) > (H^+)$            |

43 On diluting a concentrated hydrochloric acid HCl, the pH value increases as a result of .....

- (a) increasing the concentration of  $Cl^-$  ions  
(b) decreasing the concentration of  $Cl^-$  ions  
(c) increasing the concentration of  $H^+$  ions  
(d) decreasing the concentration of  $H^+$  ions

44 The patient who suffers from severe stomach acid secretion (stomach acid reflux) is advised to .....

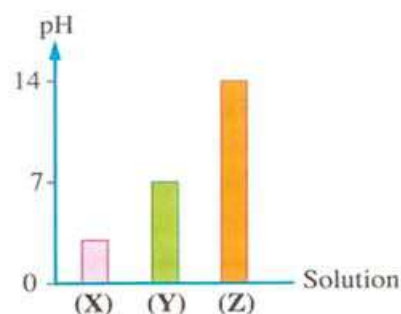
- (a) use a suitable treatment that decreases the pH value  
(b) use a suitable treatment that increases the pH value  
(c) eat food that increases the ( $H^+$ ) ions concentration  
(d) drink soda that contains percentage of  $CO_2$

45 On adding drops of sulphuric acid to an amount of distilled water, the pH value of the resulted solution becomes .....

- (a) 12 (b) 5 (c) 7 (d) 8



- 46 The opposite graph represents the pH values of three solutions (X), (Y) and (Z). Which of the following is correct about the concentration of (H<sup>+</sup>) and (OH<sup>-</sup>) ions?



- (a) In solution (X), the concentration of (H<sup>+</sup>) ion = the concentration of (OH<sup>-</sup>) ion.
- (b) In solution (Y), the concentration of (H<sup>+</sup>) ion > the concentration of (OH<sup>-</sup>) ion.
- (c) In solution (Z), the concentration of (H<sup>+</sup>) ion < the concentration of (OH<sup>-</sup>) ion.
- (d) In solution (X), the concentration of (OH<sup>-</sup>) ion > the concentration of (H<sup>+</sup>) ion.

- 47 \* The following equation expresses the hydrolysis of XY salt:



Which of the following can express the pH of the resulting solution?

- (a) 4
  - (b) 6
  - (c) 7
  - (d) 10
- 48 \* Which of the following is correct about the acid and base resulting from the dissolution of ammonium chloride salt in water?

|     | The resulting acid | The resulting base |
|-----|--------------------|--------------------|
| (a) | Strong             | Strong             |
| (b) | Weak               | Weak               |
| (c) | Strong             | Weak               |
| (d) | Weak               | Strong             |

## Second Miscellaneous Questions

- 1 Write the scientific term for each of the following statements:

- (a) A type of chemical bonds that binds between two atoms by sharing electrons where each atom shares one or more electron.
- (b) A measurement for the atom's ability to attract the electrons of the chemical bond towards itself for a longer period of time.
- (c) An electrostatic attraction between the partially positive hydrogen atom in a water molecule and the partially negative oxygen atom in an adjacent water molecule.
- (d) A reaction occurs when a solid salt is dissolved in water forming an acid and a base one or both are weak.

- (e) \* A quantitative measurement with values ranging from 0 to 14, that expresses the acidity or neutrality or alkalinity of solutions or liquids.  
\* A measurement that expresses the concentration of hydrogen ions and hydroxide ions in the solution.
- (f) The solution where the concentration of hydrogen ions equals the concentration of hydroxide ions.
- (g) The solution where the concentration of hydrogen ions is less than the concentration of hydroxide ions.
- (h) The solution where the concentration of hydrogen ions is higher than the concentration of hydroxide ions.

## 2 Give reasons for:

- (a) Water has an important role inside the living organisms' cells.
- (b) Water is a polar compound.
- (c) \* The elevation of the boiling point of pure water, although it is a covalent compound.  
\* Water is liquid while hydrogen sulphide is gas, despite their similarity in structure.
- (d) The dissolution of sodium chloride in water isn't considered hydrolysis.
- (e) \* Pure water is neutral.  
\* Water is ionically balanced.
- (f) The solution that is produced from the dissolution of ammonium bicarbonate salt in water is neutral.
- (g) The solution that is produced from the dissolution of sodium bicarbonate salt in water is alkaline.
- (h) The solution that is produced from the dissolution of ammonium chloride salt in water is acidic.

## 3 What happens in each of the following cases:

- (a) Polarity of water molecule.
- (b) Adding sodium chloride crystals to water.
- (c) Dissolution of ammonium bicarbonate salt in water "**regarding:** the concentration of  $(H^+)$  and  $(OH^-)$  ions".
- (d) Dissolution of sodium bicarbonate salt in water "**regarding:** the pH" value.
- (e) Dissolution of ammonium chloride salt in water "**regarding:** the pH" value.

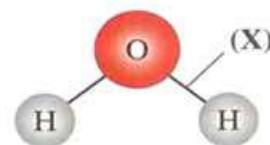
## 4 Compare between each of the following:

- (a) Pure water and hydrogen sulphide "**in terms of:** structure – boiling point – molecule polarity – presence of hydrogen bonds – molecular mass".
- (b) Ammonium bicarbonate, sodium bicarbonate and ammonium chloride salts when dissolving each of them in water "**in terms of:** the pH of the solution – the relation between the concentration of  $(H^+)$  and  $(OH^-)$  in the solution – the type of the solution".



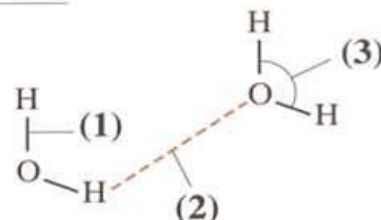
**5 Study the opposite figure, then answer:**

- (a) What is the type of bond (X)?  
 (b) Determine the places of the partial positive and partial negative charges on the figure.



**6 The opposite figure shows two types of bonds:**

- (a) What is the type of bonds (1) and (2)?  
 (b) What is the value of angle (3)?  
 (c) Determine the bond number which is responsible for the elevation of water temperature.



**7 Show a difference between the covalent bond and the hydrogen bond in water.**

**8 If you have three solutions (ammonium chloride – sodium bicarbonate – ammonium bicarbonate). How can you distinguish them by using the pH-meter?**

Questions that measure **high levels of thinking**

Answered in detail

**Choose the correct answer:**

**1** The opposite figure shows two water molecules, where a hydrogen bond is formed between the two atoms .....

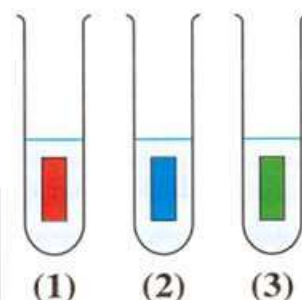
- (a) (1) and (2)      (b) (2) and (3)  
 (c) (2) and (4)      (d) (1) and (4)



**2** On adding drops of sodium hydroxide (NaOH) solution to hydrochloric acid (HCl) solution (pH = 3), the pH value of the produced solution is .....

- (a) 1      (b) 4      (c) 3      (d) 2

**3** Three pH test strips were immersed in three solutions (1), (2) and (3), as in the opposite figure. Which of the following choices is correct?



|     | Solution (1)         | Solution (2)         | Solution (3)         |
|-----|----------------------|----------------------|----------------------|
| (a) | Ammonium chloride    | Sodium bicarbonate   | Ammonium bicarbonate |
| (b) | Ammonium bicarbonate | Ammonium chloride    | Sodium bicarbonate   |
| (c) | Sodium bicarbonate   | Ammonium bicarbonate | Ammonium chloride    |
| (d) | Ammonium bicarbonate | Sodium bicarbonate   | Ammonium chloride    |

Answered

Interactive test



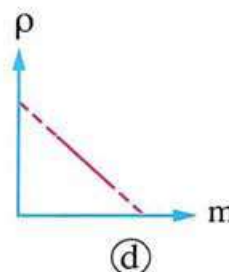
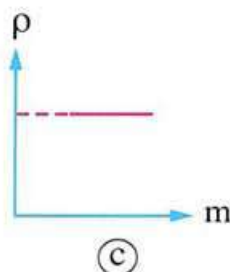
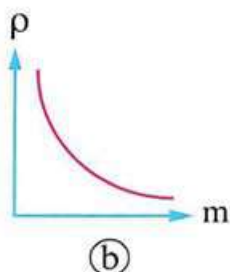
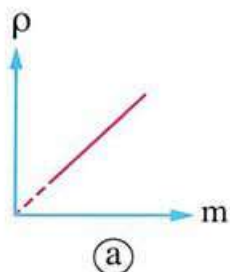
First

Multiple Choice Questions

Questions signed by \* are answered in detail.

### Density - Relative density - Hydrometer

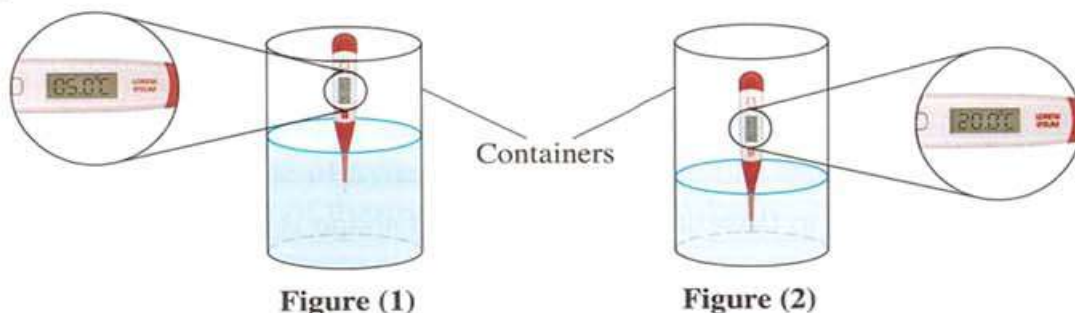
- 1 The ability of a substance to flow and not take a fixed shape is a characteristic of .....  
 (a) solids and liquids (b) solids and gases  
 (c) liquids and gases (d) solids, liquids and gases
- 2 One of the units of density measurement is .....  
 (a)  $\text{g.cm}^3$  (b)  $\text{g.mm}^{-1}$  (c)  $\text{kg.cm}^{-1}$  (d)  $\text{g.L}^{-1}$
- 3 Two solid cylinders are made of the same metal and have the same diameter, one of them is longer than the other at the same temperature, so both cylinders have the same .....  
 (a) mass (b) density (c) volume (d) weight
- 4 In an experiment to measure the degree of pollution in a swimming pool, two samples, A and B, were taken at the same time from the swimming pool with volumes of  $10 \text{ cm}^3$  and  $40 \text{ cm}^3$  respectively, so the ratio of the density of water in sample B to the density of water in sample A is expected to be .....  
 (a)  $\frac{1}{1}$  (b)  $\frac{2}{1}$  (c)  $\frac{4}{1}$  (d)  $\frac{1}{4}$
- 5 Liquid at a specific temperature was poured into a cylindrical container until its level reached the middle of the container. The density of the liquid was ( $\rho$ ), if more of the same liquid is poured at the same temperature to completely fill the container, the density of the liquid will be equal to .....  
 (a)  $\frac{1}{2} \rho$  (b)  $2 \rho$  (c)  $\frac{3}{2} \rho$  (d)  $\rho$
- 6 The graph that represents the relationship between the density ( $\rho$ ) of pure water and the mass ( $m$ ) of samples from it at a temperature of  $50^\circ\text{C}$  is .....





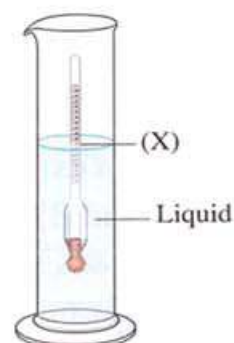
- 7 Given that the relative density of mercury is higher than the relative density of alcohol at the same temperature, then the ratio of the mass of  $1 \text{ cm}^3$  of mercury to the mass of the same volume of alcohol is ..... .  
 (a) greater than 1      (b) less than 1      (c) equal to 1      (d) indeterminable

- 8 Two containers contain two different amounts of water. A thermometer is used to measure the temperature of water in each of them, as shown in the following figures:

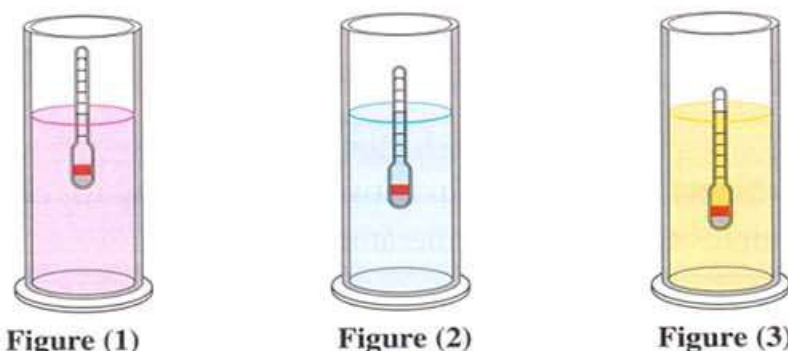


In which of the two figures (1) or (2) are the intermolecular spaces between water molecules greater?

- (a) In figure (1).      (b) In figure (2).  
 (c) Equal in both figures.      (d) Zero in both figures.
- 9 When a hydrometer is placed in a beaker containing a liquid, the free surface of the liquid intersects the hydrometer at the mark (X), as shown in the figure. When adding more of the same liquid at the same temperature until the beaker gets full, the free surface of the liquid will be ..... .  
 (a) still at the mark (X)  
 (b) above the mark (X)  
 (c) below the mark (X)  
 (d) above the hydrometer completely



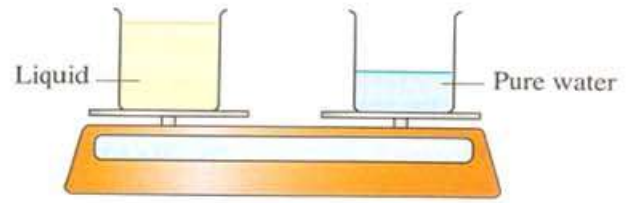
- 10 \* Three glass containers, each containing a liquid. Three identical hydrometers were used to measure the densities of the three liquids so that their positions at equilibrium were as shown in the following figures:



So, the correct order of these figures according to the density of the liquid in each container is ..... .

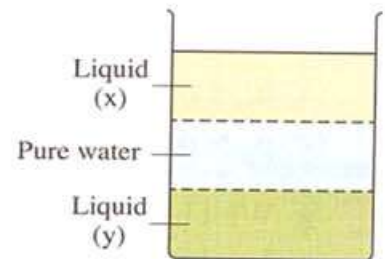
- (a)  $(1) < (2) < (3)$       (b)  $(1) < (3) < (2)$   
 (c)  $(3) < (2) < (1)$       (d)  $(2) < (3) < (1)$

- 11 \* The figure shows two similar beakers, one contains pure water while the other contains another liquid, placed on the two pans of a balance, so if the pans are balanced at the same horizontal level, the relative density of the liquid is .....



- (a) greater than 1  
(b) less than 1  
(c) equal to 1  
(d) indeterminable

- 12 \* The opposite figure shows three immiscible liquids in one container, so the ratio between the density of liquid (x) and that of liquid (y) is .....

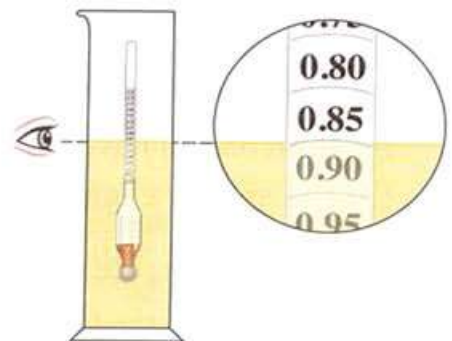


- (a) greater than 1  
(b) less than 1  
(c) equal to 1  
(d) indeterminable

- 13 If the density of the oil is 800 g/L, then its density in  $\text{g/cm}^3$  and  $\text{kg/m}^3$  is .....

|     | $\text{g/cm}^3$ | $\text{kg/m}^3$ |
|-----|-----------------|-----------------|
| (a) | 800             | 0.8             |
| (b) | 0.8             | 800             |
| (c) | 0.8             | 0.8             |
| (d) | 800             | 800             |

- 14 \* The opposite figure shows the measurement of the relative density of a sample of a liquid. If the relative density of pure water is  $1 \text{ g/cm}^3$ , the density of the liquid equals .....



- (a)  $750 \text{ kg/m}^3$   
(b)  $800 \text{ kg/m}^3$   
(c)  $850 \text{ kg/m}^3$   
(d)  $950 \text{ kg/m}^3$

- 15 \* The opposite figure shows a solid cube with a side length of 2 cm. When placed on a balance, the balance reading was 21.6 g, so the density of the cube material is .....

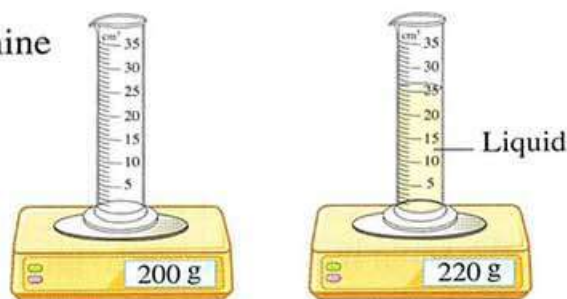


- (a)  $2700 \text{ kg/m}^3$   
(b)  $3600 \text{ kg/m}^3$   
(c)  $5400 \text{ kg/m}^3$   
(d)  $10800 \text{ kg/m}^3$



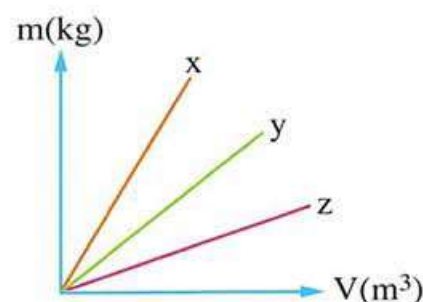
- 16 \* The opposite figure shows an experiment to determine the density of a liquid, so the density of the liquid equals .....

(a)  $600 \text{ kg/m}^3$  (b)  $700 \text{ kg/m}^3$   
(c)  $800 \text{ kg/m}^3$  (d)  $1000 \text{ kg/m}^3$

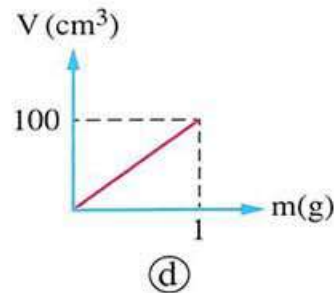
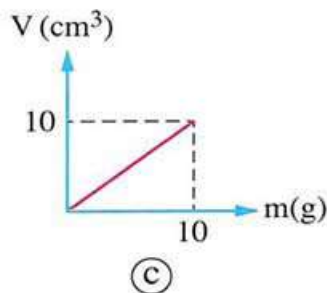
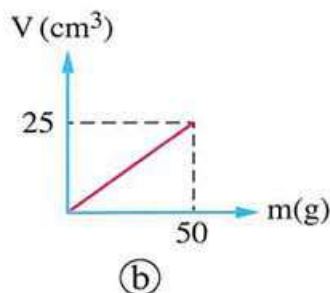
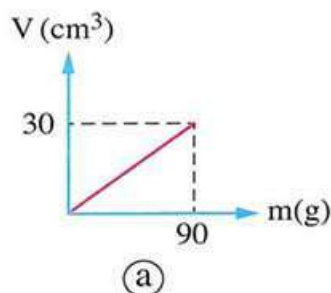


- 17 The opposite graph represents the relation between the mass (m) and the volume (V) for different samples that are taken from three liquids. (x), (y) and (z), so the correct order for the density of the three liquids is .....

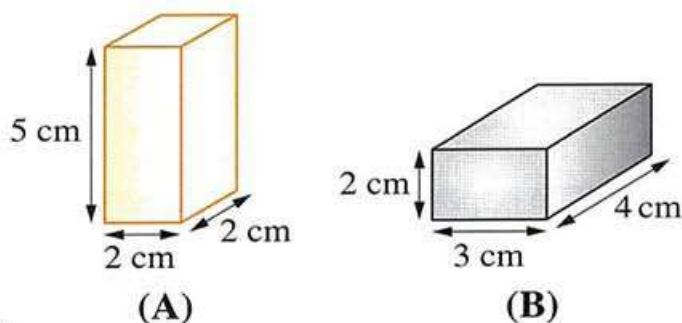
(a)  $\rho_x < \rho_y < \rho_z$  (b)  $\rho_x = \rho_y = \rho_z$   
(c)  $\rho_x > \rho_y > \rho_z$  (d)  $\rho_x < \rho_y > \rho_z$



- 18 \* Which of the following graphs represents the relation between the volume (V) in  $\text{cm}^3$  and the mass (m) in grams for samples of pure water of density  $1000 \text{ kg/m}^3$ ?

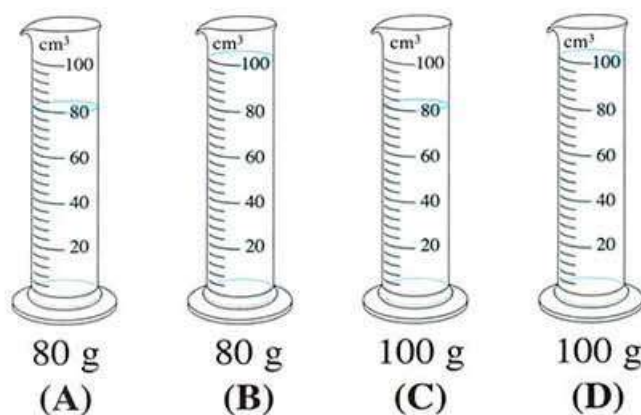


- 19 The opposite figure shows the dimensions of two solid bodies, A and B, having the same mass, so which body is made of the material of the higher density?
- (a) Body (A).  
(b) Body (B).  
(c) Both bodies have the same material density.  
(d) The answer cannot be determined.



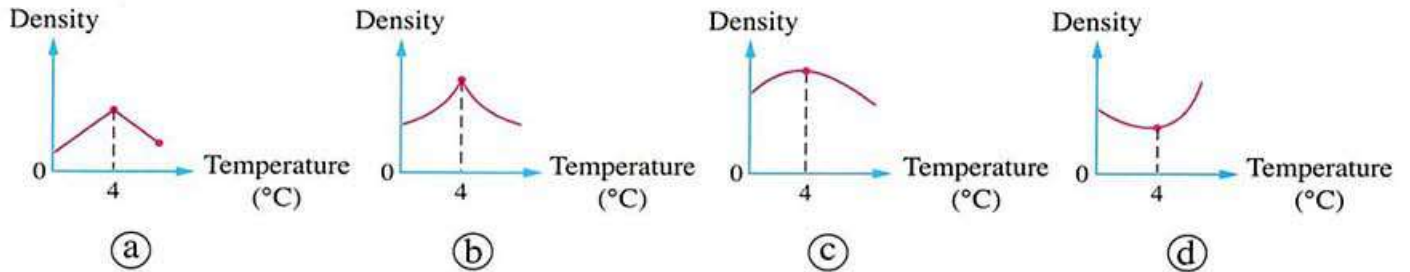
- 20 The opposite figure shows four graduated cylinders (A), (B), (C) and (D), each containing a liquid where the mass of each liquid is shown below its cylinder. All the cylinders are in the same room at a temperature of  $25^\circ\text{C}$ , so the two cylinders that contain the same liquid are .....

(a) (A) and (D) (b) (B) and (C)  
(c) (A) and (C) (d) (B) and (D)

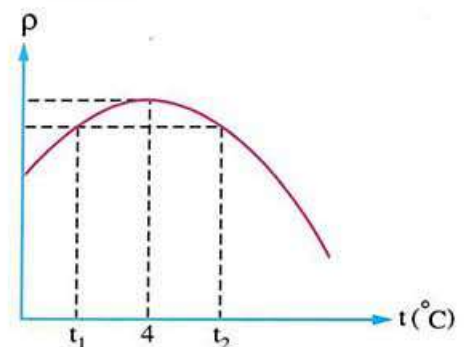


## Water density - Water currents in the oceans

- 21 The density of pure water reaches its maximum value at .....  
 (a)  $0^{\circ}\text{C}$  (b)  $4^{\circ}\text{C}$  (c)  $100^{\circ}\text{C}$  (d)  $104.5^{\circ}\text{C}$
- 22 The density of pure water at  $4^{\circ}\text{C}$  in SI (International system) units is .....  
 (a)  $1000\text{ g/m}^3$  (b)  $1\text{ g/cm}^3$  (c)  $1000\text{ kg/m}^3$  (d)  $1000\text{ kg/cm}^3$
- 23 Which of the following graphs represents the change in the density of pure water with temperature?

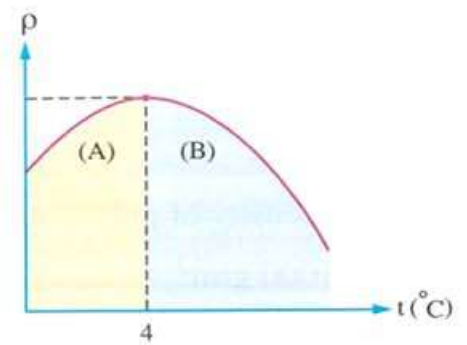


- 24 What happens to the molecules of pure water when its temperature decreases from  $4^{\circ}\text{C}$  to  $0^{\circ}\text{C}$ ?  
 (a) They get closer to each other.  
 (b) They get away from each other.  
 (c) They remain consistent in their positions.  
 (d) Their volumes decrease.
- 25 A quantity of pure water of temperature  $3^{\circ}\text{C}$  is placed in a refrigerator, then the mass and volume of the water when it freezes respectively .....  
 (a) doesn't change, doesn't change (b) doesn't change, increases  
 (c) increases, doesn't change (d) increases, increases
- 26 When the temperature of pure water increases from  $4^{\circ}\text{C}$  to  $8^{\circ}\text{C}$ , what happens to the volume and the density of water respectively?  
 (a) Increases, Increases. (b) Decreases, Increases.  
 (c) Increases, Decreases. (d) Decreases, Decreases.
- 27 The opposite graph represents the change in the density of pure water ( $\rho$ ) with temperature ( $t$ ), so the ratio of the volume of 1 g of water at temperature  $t_1$  to the volume of 1 g of water at temperature  $t_2$  is .....  
 (a) greater than 1 (b) less than 1  
 (c) equal to 1 (d) indeterminable



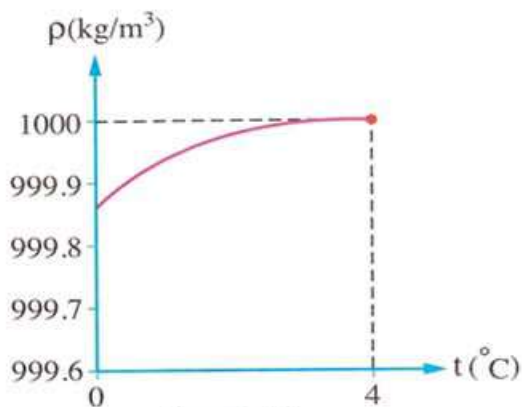


- 28 The opposite graph represents the relation between density ( $\rho$ ) of pure water and temperature ( $t$ ). Which of the regions, (A) or (B), on the graph represents the anomaly of water compared to other liquids when cooled? And why?

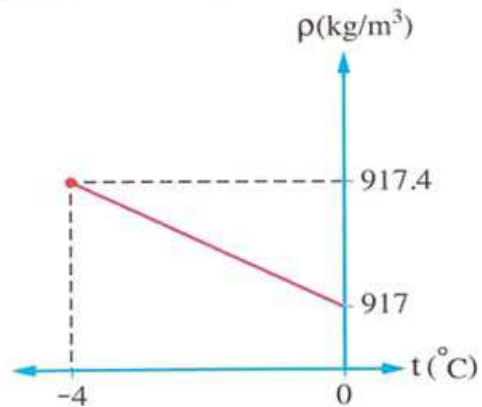


- (a) Region (A), because water expands in it.  
 (b) Region (A), because water contracts in it.  
 (c) Region (B), because water expands in it.  
 (d) Region (B), because water contracts in it.

- 29 Graph (1) represents the relation between density ( $\rho$ ) of pure water and its temperature ( $t$ ) on the Celsius scale. Graph (2) represents the same relationship for ice.



Graph (1)



Graph (2)

By studying the two graphs, the density of ice at  $0^{\circ}\text{C}$  is .....

- (a) equal to the density of liquid water at  $0^{\circ}\text{C}$   
 (b) greater than the density of liquid water at  $0^{\circ}\text{C}$   
 (c) less than the density of liquid water at  $0^{\circ}\text{C}$   
 (d) indeterminable
- 30 What is the mass of a quantity of pure water that has a volume of  $20\text{ cm}^3$  at a temperature of  $4^{\circ}\text{C}$  ?  
 (a) 10 g                      (b) 20 g                      (c) 100 g                      (d) 200 g
- 31 \* If the volume of 1 kg of pure water at a temperature of  $4^{\circ}\text{C}$  is  $V_1$  and the volume of 1 kg of pure water at a temperature of  $2^{\circ}\text{C}$  is  $V_2$ , so the ratio  $\left(\frac{V_1}{V_2}\right)$  is .....  
 (a) greater than 1            (b) less than 1            (c) equal to 1            (d) indeterminable
- 32 A quantity of pure water has a mass of 100 g, so its volume at:

(1)  $4^{\circ}\text{C}$  is .....

- (a)  $100\text{ cm}^3$                       (b) greater than  $100\text{ cm}^3$   
 (c) less than  $100\text{ cm}^3$             (d) indeterminable

(2)  $20^{\circ}\text{C}$  is .....

- (a)  $100\text{ cm}^3$                       (b) greater than  $100\text{ cm}^3$   
 (c) less than  $100\text{ cm}^3$             (d) indeterminable

33 At which of the following temperatures:

(1) does one cubic meter of pure water have the greatest mass?

- (a) 4°C                      (b) 10°C                      (c) 25°C                      (d) 80°C

(2) does one kilogram of pure water have a greater volume?

- (a) 4°C                      (b) 10°C                      (c) 25°C                      (d) 80°C

34 A quantity of pure water has a temperature of 2°C. Which of the following changes in its temperature will cause a greater decrease in its density?

- (a) Increasing by 1°C                      (b) Decreasing by 1°C  
(c) Increasing by 2°C                      (d) Decreasing by 2°C

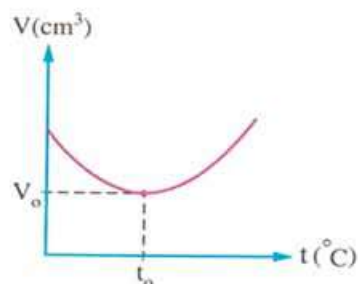
35 \* The opposite graph represents the relation between the volume ( $V$ ) of a quantity of pure water of mass 20 g and its temperature ( $t$ ), so:

(1) The value of ( $t_0$ ) on the graph equals .....

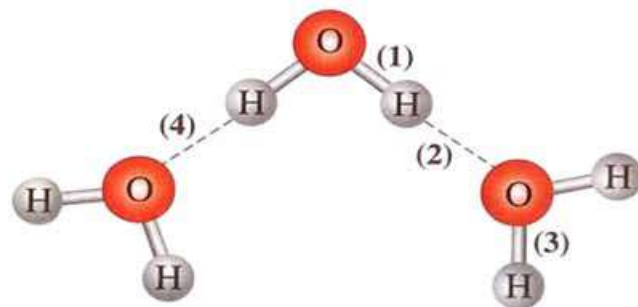
- (a) 2°C                      (b) 4°C  
(c) 8°C                      (d) 10°C

(2) The value of ( $V_0$ ) on the graph equals .....

- (a) 9.9 cm<sup>3</sup>                      (b) 10 cm<sup>3</sup>                      (c) 20 cm<sup>3</sup>                      (d) 22 cm<sup>3</sup>



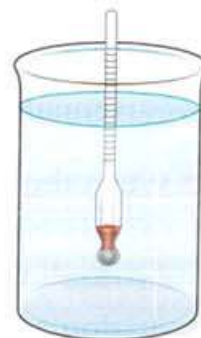
36 \* The opposite figure shows some water molecules, so the bonds that are responsible for the unique behavior of water density compared to the other compounds of similar composition are .....



- (a) (1), (2)                      (b) (1), (3)  
(c) (3), (4)                      (d) (2), (4)

37 \* The opposite figure shows a hydrometer balanced in pure water. What happens to the hydrometer if salt is added and dissolved in the water?

- (a) A larger part of it sinks into the water.  
(b) A larger part of it floats up.  
(c) The length of the floating part of it does not change.  
(d) The answer cannot be determined.





38 \* A beaker contains pure water at a temperature of  $4^{\circ}\text{C}$ . What happens to the density of the water in the beaker when:

(1) adding an equal quantity of pure water at  $10^{\circ}\text{C}$  to the beaker?

- (a) Increases.
- (b) Decreases.
- (c) Doesn't change.
- (d) The answer cannot be determined.

(2) dissolving a quantity of salt in it?

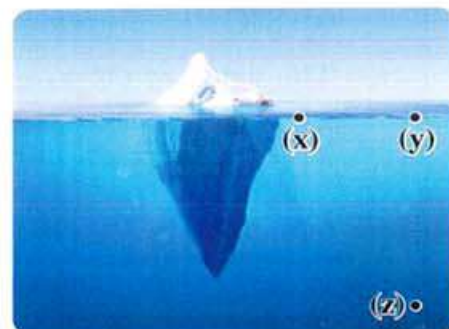
- (a) Increases.
- (b) Decreases.
- (c) Doesn't change.
- (d) The answer cannot be determined.

39 Which of the following factors doesn't directly affect ocean currents?

- (a) Variation of the water salinity.
- (b) Variation of the water temperature.
- (c) Variation of the water pressure.
- (d) Variation of the marine organism's species.

40 The opposite figure shows an iceberg in an ocean, At which of the positions (x), (y), (z) shown in the figure the water has the higher density?

- (a) Position (x).
- (b) Position (y).
- (c) Position (z).
- (d) The water density is the same at all three positions.



41 At which of the following positions in water the density of water is higher assuming all are at a temperature of  $4^{\circ}\text{C}$  ?

- (a) Deep Ocean.
- (b) Sea surface.
- (c) The surface of a lake of freshwater.
- (d) The bottom of a frozen river.

42 \* In a closed saltwater lake, when the water level decreases in the lake over time due to evaporation of water from it, the density of the lake water .....

- (a) increases
- (b) decreases
- (c) remains unchanged
- (d) the answer cannot be determined

43 When the melting glaciers enter the ocean water, they .....

- (a) mix because each is a liquid water with the same density
- (b) don't mix and the salty water floats on the surface of the fresh water
- (c) don't mix and the fresh water floats on the surface of the salty water
- (d) mix because they are two liquids with different density

# Internal energy - Temperature - Amount of heat

- 44 The internal energy of a body is equal to .....
- (a) the average kinetic energy of the body's molecules
  - (b) the average potential energy of the body's molecules
  - (c) the difference between the kinetic energies of the body's molecules and their potential energies
  - (d) the sum of the kinetic energies of the body's molecules and their potential energies

- 45 The thermal energy that is transferred from hot bodies to cold bodies is called .....
- (a) temperature
  - (b) specific heat
  - (c) amount of heat
  - (d) internal energy

- 46 Which pair of the following physical quantities have the same unit of measurement?
- (a) Amount of heat and temperature.
  - (b) Specific heat and temperature.
  - (c) Amount of heat and internal energy.
  - (d) Internal energy and temperature.

- 47 When heating a quantity of water from  $10^{\circ}\text{C}$  to  $20^{\circ}\text{C}$ , then .....

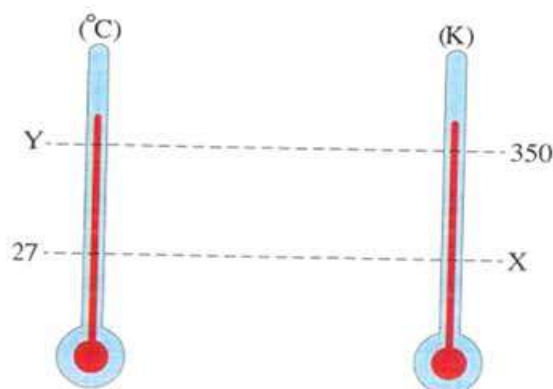
|     | The amplitude of water molecules vibrations | The internal energy of water |
|-----|---------------------------------------------|------------------------------|
| (a) | Decreases                                   | Increases                    |
| (b) | Increases                                   | Doesn't change               |
| (c) | Increases                                   | Increases                    |
| (d) | Doesn't change                              | Decreases                    |

- 48 The absolute zero is equivalent to .....

- (a)  $0^{\circ}\text{C}$
- (b)  $-273^{\circ}\text{C}$
- (c)  $273\text{ K}$
- (d)  $373\text{ K}$

- 49 The opposite figure represents corresponding values of temperature on Kelvin and Celsius scales, what are the values of temperature X and Y, respectively?

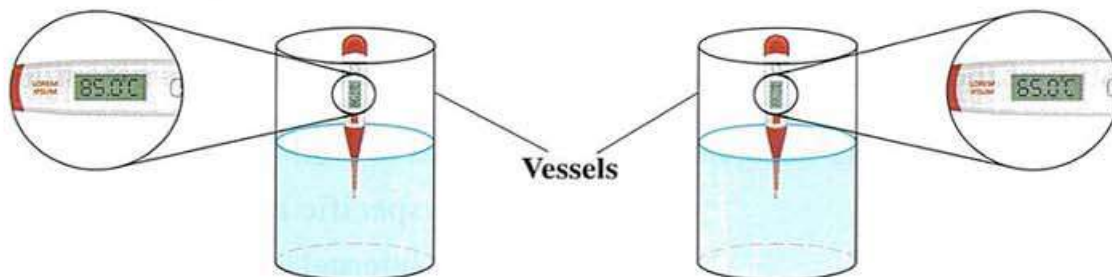
- (a)  $300\text{ K}$ ,  $30^{\circ}\text{C}$
- (b)  $327\text{ K}$ ,  $30^{\circ}\text{C}$
- (c)  $300\text{ K}$ ,  $77^{\circ}\text{C}$
- (d)  $327\text{ K}$ ,  $77^{\circ}\text{C}$





- 50 The internal energy of a water quantity of mass 1 kg is higher at a temperature of .....  
(a)  $4^{\circ}\text{C}$  (b) 340 K (c)  $40^{\circ}\text{C}$  (d) 300 K

- 51 When the temperatures of two quantities of water were measured using a thermometer, the thermometer readings were recorded as shown in the following figures:



So, the difference between the temperatures of the two quantities of water on Kelvin scale is equal to .....

- (a) 273 K (b) 293 K (c) 253 K (d) 20 K
- 52 At what temperature does the mass of a sample of distilled water in (grams) equal the volume of the sample in ( $\text{cm}^3$ )?  
(a)  $100^{\circ}\text{C}$  (b) 373 K (c) 277 K (d)  $273^{\circ}\text{C}$

- 53 A certain quantity of a substance whose temperature is raised from  $30^{\circ}\text{C}$  to 310 K, then the amount of change in temperature is equal to .....  
(a) 7 K (b)  $37^{\circ}\text{C}$  (c) 280 K (d)  $280^{\circ}\text{C}$

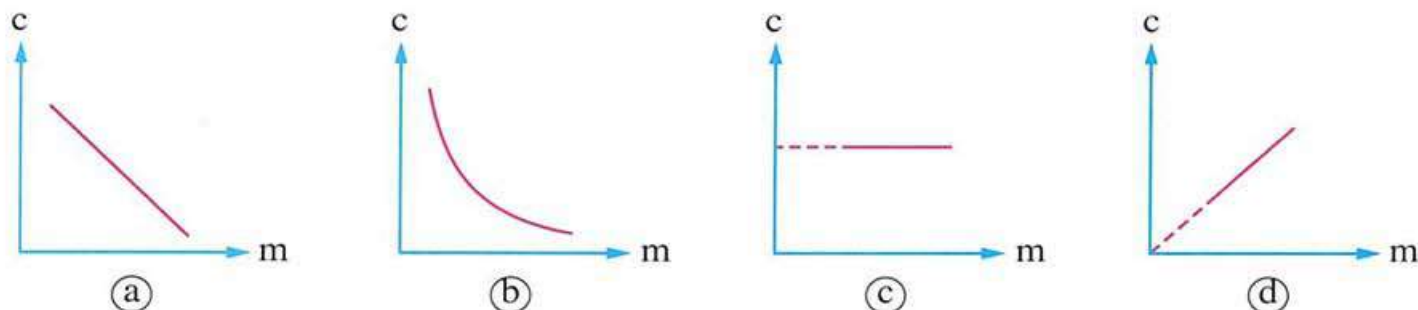
- 54 \* If the temperature of an object is 220 K, then when the temperature of this object changes to  $-3^{\circ}\text{C}$ , the average kinetic energy of the molecules of that object .....  
(a) increases (b) decreases  
(c) doesn't change (d) Can't be determined the answer

- 55 When you put ice cubes in your hand, .....  
(a) heat flows from ice to your hand (b) heat flows from your hand to ice  
(c) coldness flows from ice to your hand (d) coldness flows from your hand to ice

- 56 What happens to a piece of iron whose temperature is  $-10^{\circ}\text{C}$  when it is placed in an insulated cup containing water at a temperature of  $10^{\circ}\text{C}$ ?  
(a) The internal energy of the iron piece decreases.  
(b) The density of the iron increases.  
(c) The mass of the iron decreases.  
(d) The speed of the iron molecules increases.

## Specific heat

- 57 If the amount of heat absorbed by a body doubles, its specific heat .....
- (a) doubles (b) halves  
(c) remains constant (d) becomes a quarter
- 58 Which of the following graphs represents the relation between the specific heat ( $c$ ) of a certain metal and the mass ( $m$ ) of several bodies of that metal?

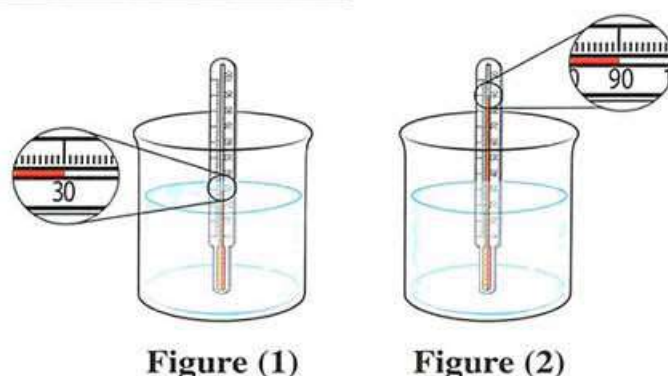


- 59 If you know that the specific heat of glass in  $\text{J/kg}^\circ\text{C}$  is 840, then it is equivalent in  $\text{J/kg.K}$  to .....
- (a) 1113 (b) 840 (c) 567 (d) 3.08

- 60 A body with a mass of 150 g absorbed an amount of heat of 8100 J, so its temperature rose from  $30^\circ\text{C}$  to  $90^\circ\text{C}$ . Using the opposite table, what is the substance of this body?
- (a) Copper. (b) Aluminum.  
(c) Iron. (d) Lead.

| The substance | Specific heat ( $\text{J/kg.K}$ ) |
|---------------|-----------------------------------|
| Copper        | 390                               |
| Aluminum      | 900                               |
| Iron          | 450                               |
| Lead          | 128                               |

- 61 \* A beaker contains 325 g of water as shown in figure (1). If the specific heat of water is  $4200 \text{ J/kg.K}$ , so the amount of heat required to raise the temperature of water to be as shown in figure (2) is .....
- (a) 38220 J (b) 81900 J  
(c) 95550 J (d) 121485 J



- 62 \* The temperature of a piece of aluminum of mass 0.3 kg has changed from  $20^\circ\text{C}$  to 253 K, given that the specific heat of aluminum is  $900 \text{ J/kg.K}$ , the piece of aluminum has .....
- (a) absorbed an amount of heat of 10800 J (b) absorbed an amount of heat of 62700.3 J  
(c) lost an amount of heat of 10800 J (d) lost an amount of heat of 62700.3 J

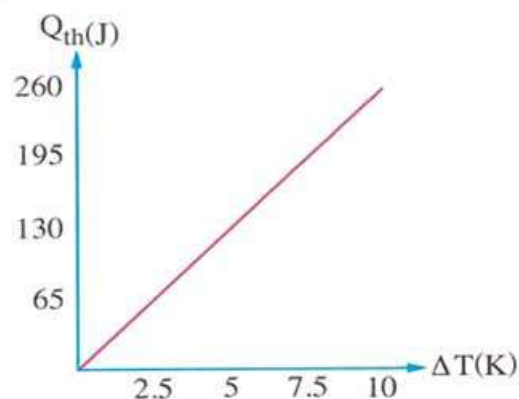


- 63 A body of mass 2 kg made of a material of specific heat  $2 \times 10^3 \text{ J/kg.K}$ . If its temperature was  $27^\circ\text{C}$ , then it has absorbed an amount of heat of  $10^4 \text{ J}$ , the temperature of the body .....

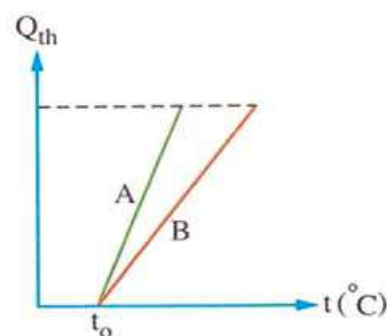
(a) rises to 325 K (b) rises to  $325^\circ\text{C}$   
(c) increases by 2.5 K (d) increases by 5 K

- 64 \* The opposite graph represents the relation between the amount of heat ( $Q_{\text{th}}$ ) absorbed by a piece of lead of mass 200 g and the change in its temperature ( $\Delta T$ ), so the specific heat of lead is .....

(a)  $120 \text{ J/kg.K}$   
(b)  $125 \text{ J/kg.K}$   
(c)  $130 \text{ J/kg.K}$   
(d)  $135 \text{ J/kg.K}$

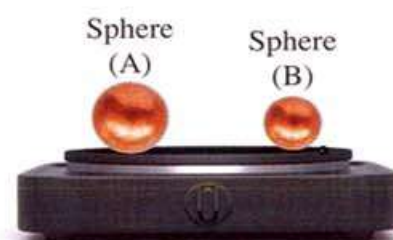


- 65 Two quantities of two liquids A and B with the same mass were heated from a temperature  $t_0$  and the opposite graph represents the relation between the amount of heat ( $Q_{\text{th}}$ ) absorbed by each liquid and its temperature ( $t$ ), so which liquid has a higher specific heat?



- (a) Liquid A.  
(b) Liquid B.  
(c) The two liquids have the same specific heat.  
(d) The answer cannot be determined.

- 66 \* Two solid copper spheres A and B are placed together on an electric hot plate as shown in the opposite figure. Which sphere will have a higher temperature increase during the same period of time?



- (a) Sphere (A).  
(b) Sphere (B).  
(c) Both spheres will have the same temperature increase.  
(d) The answer cannot be determined.

- 67 A mass ( $m$ ) of iron gained an amount of heat equal to  $(X)\text{J}$  and its temperature was raised from  $20^\circ\text{C}$  to  $50^\circ\text{C}$ . If a mass ( $m$ ) of water gained the same amount of heat of  $(X)\text{J}$ , then its temperature would rise by .....

(a)  $30^\circ\text{C}$  (b) greater than  $30^\circ\text{C}$   
(c) less than  $30^\circ\text{C}$  (d) The answer can't be determined

- 68 \* The opposite table illustrates the specific heat of four different substances W, X, Y and Z of the same mass. If they gained the same amount of heat, the substance whose temperature rises by a greater amount is .....

| The substance | specific heat (J/kg.°C) |
|---------------|-------------------------|
| W             | 450                     |
| X             | 390                     |
| Y             | 900                     |
| Z             | 128                     |

(a) W (b) X (c) Y (d) Z

- 69 \* Two solid bodies, (1) and (2), made of the same material with masses  $m_1$  and  $m_2$ , respectively, if each of them has absorbed an amount of heat  $Q$  so that their temperatures have increased by  $5^\circ\text{C}$  and  $10^\circ\text{C}$  respectively, the ratio of their masses  $\left(\frac{m_1}{m_2}\right)$  is .....

(a)  $\frac{1}{2}$  (b)  $\frac{1}{1}$  (c)  $\frac{2}{1}$  (d)  $\frac{4}{1}$

- 70 \* Two equal masses of liquids (a) and (b) of specific heat capacities  $c_a$  and  $c_b$  respectively, are miscible but doesn't react together. The temperatures of the two liquids were  $80^\circ\text{C}$  and  $10^\circ\text{C}$ , respectively. If the two liquids are mixed to reach thermal equilibrium at a final temperature  $30^\circ\text{C}$ , the ratio  $\left(\frac{c_a}{c_b}\right)$  equals .....

(a)  $\frac{1}{3}$  (b)  $\frac{3}{1}$  (c)  $\frac{2}{5}$  (d)  $\frac{5}{2}$

- 71 The following figures show four aluminum bodies. The mass and initial temperature of each of them are recorded below it. If each of these bodies is placed separately in a beaker with the same quantity of water of temperature  $10^\circ\text{C}$ , which object will cause a greater increase in the temperature of the water?



10 g  
 $20^\circ\text{C}$

(a)



20 g  
 $10^\circ\text{C}$

(b)



30 g  
 $5^\circ\text{C}$

(c)



50 g  
 $20^\circ\text{C}$

(d)

- 72 \* A quantity of water of mass 0.5 kg is being heated such that it gains heat at a rate of 42000 J/min. If the specific heat of water is 4200 J/kg.K, then the time required to raise the temperature of this quantity of water from  $25^\circ\text{C}$  to  $85^\circ\text{C}$  equals .....

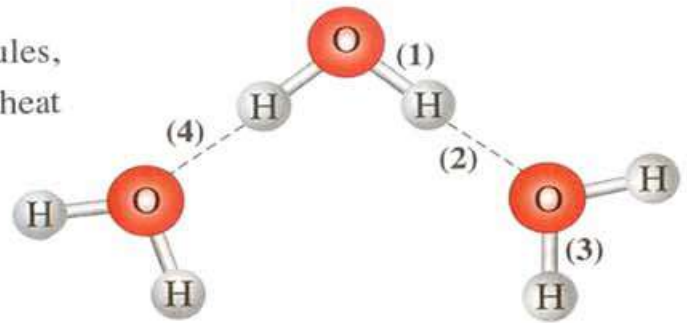
(a) 0.5 minutes (b) 1 minutes  
(c) 3 minutes (d) 6 minutes



### Specific heat of water

- 73 The opposite figure shows some water molecules, so the bonds responsible for the high specific heat of water are .....

- (a) (1), (2)
- (b) (1), (3)
- (c) (3), (4)
- (d) (2), (4)



- 74 The following figures represent the water molecules in three different physical states:



Figure (1)



Figure (2)

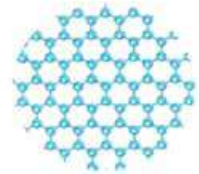


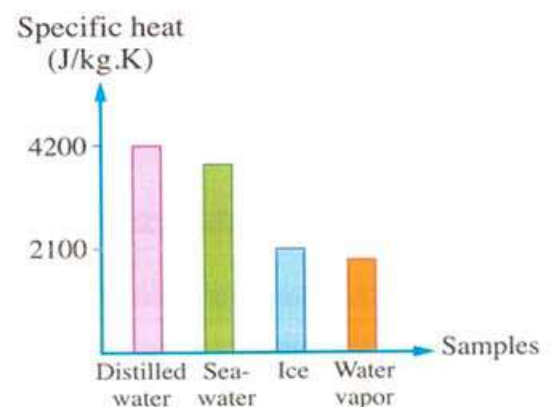
Figure (3)

Then the specific heat of water is .....

- (a) greatest in (1)
  - (b) greatest in (2)
  - (c) greatest in (3)
  - (d) equal in the three figures
- 75 Two equal masses of water and oil were at the same temperature in two identical containers. If the two containers are placed together on an electric hot plate, then the temperature of the oil reaches  $T$  in time  $t_o$ . Given that the specific heat capacity of water is greater than the specific heat capacity of oil, the temperature of the water will reach  $T$  in a time .....
- (a) greater than  $t_o$
  - (b) less than  $t_o$
  - (c) equal to  $t_o$
  - (d) the answer cannot be determined

- 76 The opposite figure shows the specific heat capacities of four different samples of the same mass. Which of these samples requires a greater amount of heat to raise its temperature by 1 K?

- (a) The sample of water vapor.
- (b) The sample of ice.
- (c) The sample of seawater.
- (d) The sample of distilled water.



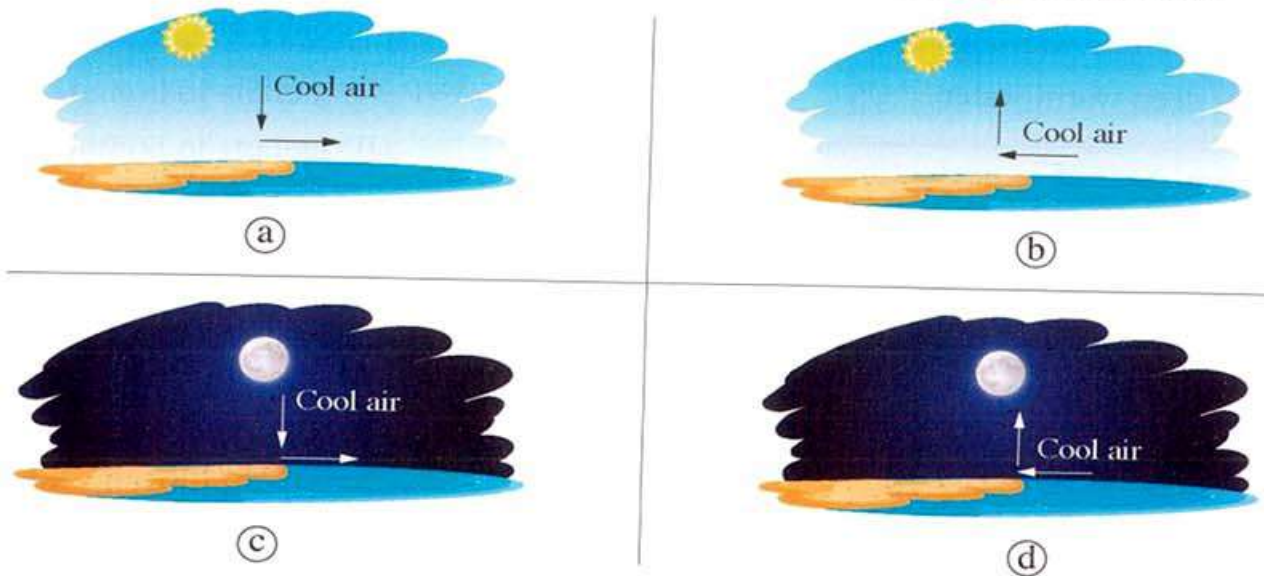
77 Which of the following properties has a high value that is responsible for the slow change in water temperature in large water bodies?

- (a) Density of water. (b) Salinity of water.  
(c) Specific heat of water. (d) pH value of water.

78 Which of the following substances, a unit mass of it has the capacity to store thermal energy for a longer period of time immediately after sunset?

- (a) Oceans. (b) Coastal sands.  
(c) Atmospheric air. (d) Mountain rocks.

79 Which of the following diagrams shows the mechanism of sea breeze formation?



80 Figures (1) and (2) represent a coastal area during the day and night, respectively,

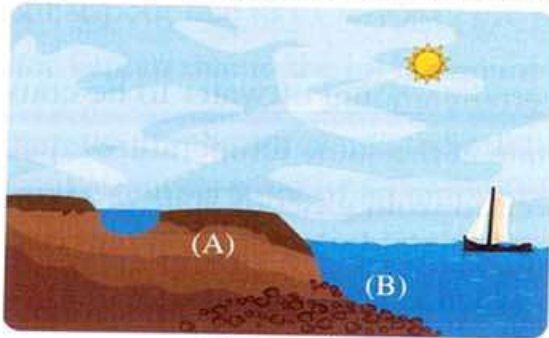


Figure (1)

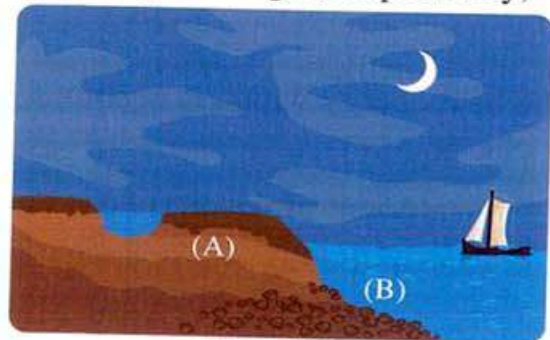


Figure (2)

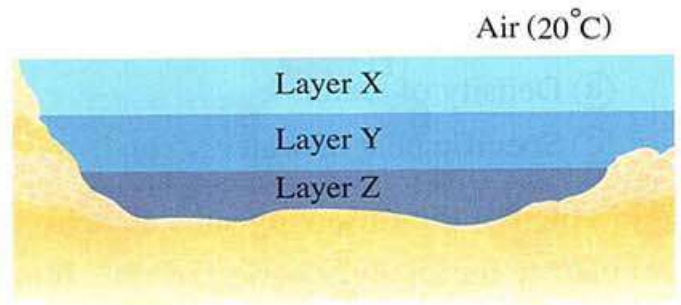
Which of the following conclusions is correct about the temperature of spot (A) compared to spot (B)?

|     | In figure (1) | In figure (2) |
|-----|---------------|---------------|
| (a) | Higher        | Higher        |
| (b) | Higher        | Lower         |
| (c) | Lower         | Higher        |
| (d) | Lower         | Lower         |



- 81 The opposite figure shows a cross-section of ocean water. Which layer in the figure is distinguished as the most stable in terms of temperature compared to the other layers?

(a) Layer X.  
 (b) Layer Y.  
 (c) Layer Z.  
 (d) Layers X and Y.



- 82 The most suitable marine environment for coral reef prosperity is .....

(a) the shallow warm water  
 (b) the shallow cold water  
 (c) the deep warm water  
 (d) the deep cold water

### — Latent heat of vaporization

- 83 The latent heat of vaporization is the heat energy which is absorbed by a unit mass of the material .....

(a) to increase its temperature by 1 K.  
 (b) to decrease its temperature by 1 K.  
 (c) during its conversion from liquid to gas without change in temperature.  
 (d) during its conversion from solid to liquid without change in temperature.

- 84 Measuring unit of the latent heat of vaporization is .....

(a) J  
 (b) J/kg  
 (c) J/K  
 (d) J/kg.K

- 85 If the heat energy which is absorbed by a certain amount of water to be converted from the liquid state at 100°C to gaseous state at the same temperature equals (E), so the same amount of water vapor to be converted from gaseous state at 100°C to the liquid state at the same temperature, it must .....

(a) absorb the same amount of heat energy (E)  
 (b) absorb amount of heat energy greater than (E)  
 (c) emit the same amount of heat energy (E)  
 (d) emit amount of heat energy less than (E)

- 86 An amount of water of mass 10 kg needs an amount of heat energy (E) to be converted from liquid water at 100°C into water vapor at the same temperature, so the latent heat of vaporization equals .....

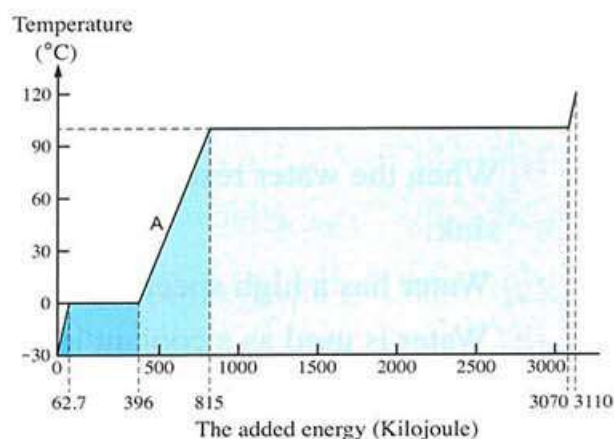
(a) E  
 (b) 10 E  
 (c)  $\frac{E}{10}$   
 (d)  $\frac{E}{100}$

- 87 The latent heat of vaporization of water ..... .
- (a) is high due to the strong covalent bonds between the oxygen and hydrogen atoms.
  - (b) is high due to the strong hydrogen bonds between the water molecules.
  - (c) is low due to the weakness of the covalent bonds between the oxygen and hydrogen atoms.
  - (d) is low due to the weakness of the hydrogen bonds between the water molecules.
- 88 Two students, each of them used a method to cool his warm drink as follows:  
 Method of student (I) : he added 25 g of cold water at  $0^{\circ}\text{C}$  to the drink.  
 Method of student (II) : he added 25 g of ice at  $0^{\circ}\text{C}$  to the drink.  
 Which of the two methods is more efficient in cooling the drink?
- (a) Method of student (I).
  - (b) Method of student (II).
  - (c) Both methods are equivalent since the added mass is constant.
  - (d) Both methods are equivalent because both of water and ice are at  $0^{\circ}\text{C}$
- 89 Which causes more severe skin burns, being exposed to water vapor of  $100^{\circ}\text{C}$  or being exposed to liquid water at the same temperature?  
 (Where: the skin is exposed to the same amount of water and water vapor for the same interval of time).
- (a) Liquid water due to its high specific heat.
  - (b) Liquid water due to the high amount of heat which it emits during boiling.
  - (c) Water vapour due to its low specific heat.
  - (d) Water vapour due to the high amount of heat which it emits at condensation.

- 90 The opposite graph represents the relation between the temperature of an amount of water and the heat energy which is absorbed by that amount, if the amount of heat energy which is absorbed by an amount of water to increase its temperature from  $0^{\circ}\text{C}$  to  $100^{\circ}\text{C}$  is ( $E_1$ ) and the amount of heat energy which is absorbed by the same amount of water to be converted from liquid to vapour without changing its temperature equals ( $E_2$ ),

so .....

- (a)  $E_1 > E_2$
- (b)  $E_1 < E_2$
- (c)  $E_1 = E_2$
- (d) the answer is indeterminable.





## Second Miscellaneous Questions

### 1 Write the scientific term for each of the following statements:

- (a) Any substance that can flow and does not have a fixed shape but takes the shape of its container.
- (b) The mass of a unit volume of a substance.
- (c) The ratio of the density of a certain substance to the density of pure water at 4°C.
- (d) The sum of kinetic and potential energies of the molecules of a body or a system.
- (e) - A quantitative description of the hotness or coldness of a body or a system.  
- A measure of the average kinetic energy of the molecules of a body or a system.
- (f) The thermal energy transferred from, to or through a body when there is a difference in temperature.
- (g) The amount of heat required to raise the temperature of 1 kg of a substance by 1 degree Celsius.
- (h) Organisms that sustain their internal body temperature, independent of the surrounding environment.
- (i) Organisms that depend on external sources to regulate their body temperature.
- (j) The emitted heat energy from a unit mass of the substance during its conversion from gaseous state into liquid state without change in temperature.

### 2 Give reasons for:

- (a) The density of a pure substance does not change when the mass or volume of the sample taken from it changes.
- (b) Density has a unit of measurement, while relative density has no unit of measurement.
- (c) The presence of mercury in the hydrometer bulb.
- (d) The freezing of lake water in polar regions begins at the surface rather than the bottom.
- (e) Fish live without freezing in frozen lakes or rivers.
- (f) When the water resulting from the melting of ice enters the ocean, it floats and doesn't sink.
- (g) Water has a high specific heat compared to other liquids.
- (h) Water is used as a coolant in car engines and factories.
- (i) Large bodies of water moderate the temperature of their surrounding areas.
- (j) The high latent heat of vaporization of water.
- (k) The importance of the high latent heat of vaporization of water for the living organisms.

### 3 What happens when increasing the temperature of a body, "concerning: its density"?

4 Compare between each of the following:

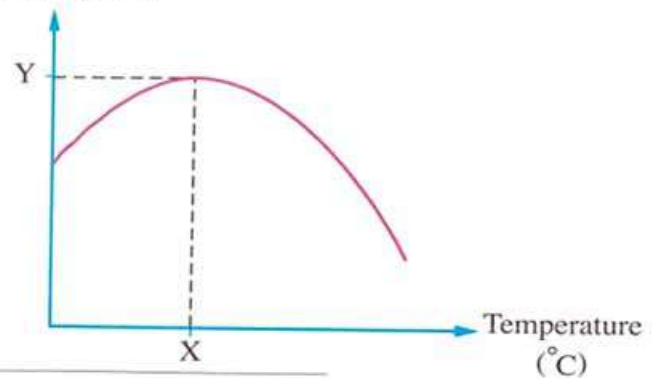
- (a) Temperature and amount of heat (**in terms of:** definition and international unit of measurement).
- (b) Celsius scale and Kelvin scale in terms of: freezing point and boiling point of water.
- (c) Warm blooded organisms and cold-blooded organisms in terms of: the method of regulating their body temperature - examples.

5 Mention the factors affecting each of:

- (a) The density of the pure substance.
- (b) The amount of heat lost or gained by a substance when its temperature changes.

6 The opposite figure represents the relation Density ( $\text{kg/m}^3$ )

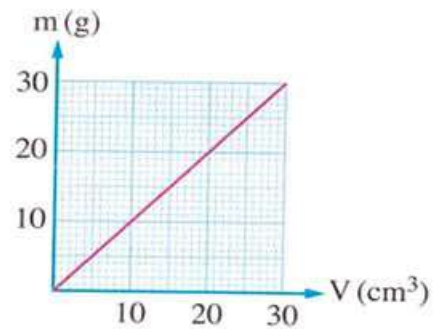
between the density of pure water in ( $\text{kg/m}^3$ ) and temperature in ( $^{\circ}\text{C}$ ), so **what** is the value of each of X, Y in the figure?



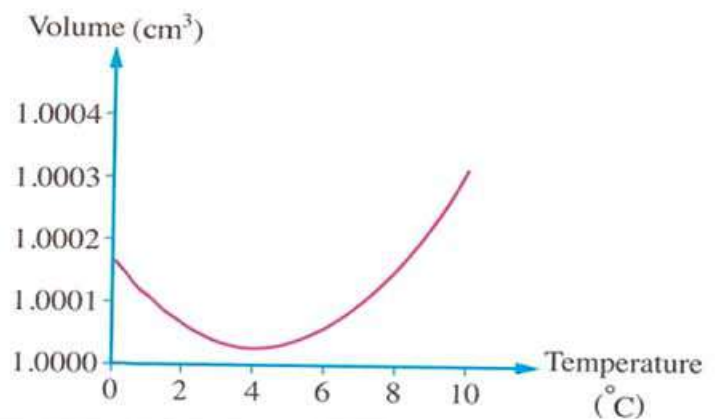
7 The opposite graph represents the relation between the mass (m) of different quantities of pure water and the volume (V) of each at a constant temperature.

**What do you expect to be:**

- (a) The temperature of the water? **Explain.**
- (b) The mass of  $500 \text{ cm}^3$  of water at the same temperature?



8 Analyze the opposite graph and **deduce what happens to** the water density with the change in temperature.



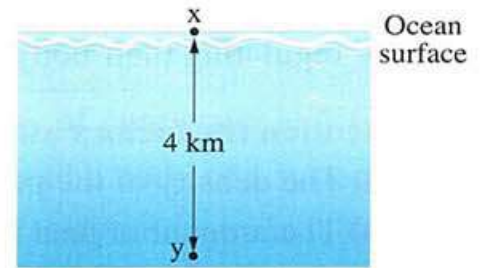
9 Explain how the behavior of water differs from other liquids when studying the effect of changing temperature on density.

10 Give an example of how the changes in temperature and water density can affect living organisms in an aquatic environment.



- 11 **How** can you increase the density of water that was at room temperature in two methods?
- 12 **Mention** the factors that affect the density of water in the oceans and **explain** the effect of each.

- 13 In the opposite figure, **explain** why the density of water at point y is greater than at point x.



- 14 **Analyze** the data presented in the opposite table, then answer the following questions:

| Substance   | Temperature (°C) | Physical state | Specific heat (J/kg.K) |
|-------------|------------------|----------------|------------------------|
| Air         | 25               | Gas            | 1005                   |
| Lead        | 25               | Solid          | 128                    |
| Pure water  | 25               | Liquid         | 4200                   |
| Water vapor | 100              | Gas            | 2020                   |
| Ice         | 0                | Solid          | 2100                   |

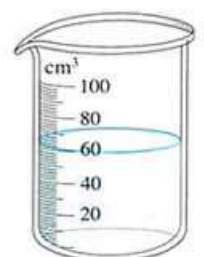
- (a) **What** are the factors on which the specific heat of matter depends?
- (b) **Which** of the three states of water has the greatest value of specific heat?
- 15 Considering the different specific heats of land and seawater, **explain** the phenomenon of the sea breeze.

- 16 On the opposite figure, **draw** arrows to indicate the directions of the air currents, **identifying** which of these currents represents the sea breeze.



- 17 **Explain why** the specific heat of water is a critical factor in the sustainability of marine life.
- 18 Assuming that the specific heat of water is low, **what** would be the impact of that on marine life? (one effect is enough)
- 19 If the relative density of aluminum is 2.7 and the density of water at 4°C is  $10^3 \text{ kg/m}^3$ , **calculate** the density of aluminum.

- 20 **The opposite figure** shows a graduated beaker containing a sample of canal water. When a hydrometer is placed in the sample, it shows that the relative density of the sample is 1.02. **What** is the mass of the canal water sample in the beaker?



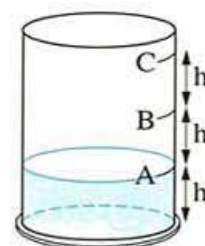
- 21 A quantity of pure water whose volume at a temperature of  $4^{\circ}\text{C}$  equals  $1\text{ m}^3$  is cooled until it freezes, **calculate** the increase in its volume when it turns into ice of density  $917\text{ kg/m}^3$
- 22 If you know that the boiling point of ethyl alcohol is  $78^{\circ}$  on the Celsius scale, **calculate** its boiling point on the Kelvin scale.
- 23 **What** is the value on the Kelvin scale that is equal to four times its corresponding value on the Celsius scale?
- 24 A copper piece of mass  $0.3\text{ kg}$  had temperature of  $20^{\circ}\text{C}$ . If it absorbed an amount of heat of  $5850\text{ J}$ , **calculate** its final temperature. (Given that: the specific heat of copper is  $390\text{ J/kg.K}$ ).
- 25 A piece of aluminum its temperature is  $30^{\circ}\text{C}$  gained amount of heat of  $500\text{ J}$ , so its temperature rose to  $310\text{ K}$ . **Calculate** the mass of aluminum piece. (Given that: the specific heat of aluminum is  $900\text{ J/kg.K}$ ).
- 26  $50\text{ kg}$  of hot water whose temperature is  $90^{\circ}\text{C}$  was added to  $20\text{ kg}$  of cold water whose temperature is  $20^{\circ}\text{C}$ , **determine** the final temperature of water.

### Questions that measure **high levels of thinking**

Answered in detail

#### Choose the correct answer:

- 1 A flask containing a sample of seawater was placed on the pan of a balance. The reading of the balance for the water and the flask together was  $100\text{ g}$ , as shown in the figure. Knowing that the density of seawater is  $1030\text{ kg/m}^3$ , what do you expect the volume of the sample to be?
- (a) Greater than  $97\text{ cm}^3$       (b) Equal to  $97\text{ cm}^3$   
 (c) Less than  $97\text{ cm}^3$       (d) Cannot be determined.
- 2 The opposite figure shows a container containing an amount of liquid X of relative density 2 with a mass  $m$ . If an amount of liquid Y of relative density 1 is added to the container with a mass  $m$  and does not mix with the first liquid, the surface level of liquid Y will settle .....
- (a) at level B      (b) at level C  
 (c) between levels A and B      (d) between levels B and C

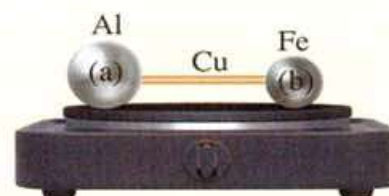




- 3 Two identical containers (1) and (2) contain equal quantities of pure water at temperatures  $t_1$  and  $t_2$ , respectively. The temperatures of both containers increased by one degree, causing an increase in the density of water in container (1) and a decrease in the density of water in container (2). Which of the following could represent the temperatures  $t_1$ ,  $t_2$  respectively?

(a)  $1^\circ\text{C}$ ,  $3^\circ\text{C}$       (b)  $4^\circ\text{C}$ ,  $6^\circ\text{C}$       (c)  $3^\circ\text{C}$ ,  $6^\circ\text{C}$       (d)  $6^\circ\text{C}$ ,  $3^\circ\text{C}$

- 4 Two solid spheres, (a) and (b), of the same mass were at the same temperature. Sphere (a) is made of aluminum and sphere (b) is made of iron, then the two spheres are placed on an electric hot plate for a while. If the spheres are connected together by a copper rod as shown in the opposite figure, in which direction does heat flow through the copper rod? (Given that:  $c_{\text{Al}} > c_{\text{Fe}}$ )



- (a) From sphere (a) to sphere (b).  
 (b) From sphere (b) to sphere (a).  
 (c) No heat flows between the two spheres.  
 (d) Heat flows equally between the two spheres.

- 5 The opposite table shows the specific heat capacities of some materials, so from the following masses of these materials, which mass requires the least amount of thermal energy to change its temperature by 2 K?

| The material | Specific heat (J/kg.K) |
|--------------|------------------------|
| Copper       | 390                    |
| Iron         | 450                    |
| Aluminum     | 900                    |
| Water        | 4200                   |

- (a) 250 grams of copper.  
 (b) 225 grams of iron.  
 (c) 100 grams of aluminum.  
 (d) 50 grams of water.

- 6 An insulated aluminum container of mass 20 g contains 150 g of water at a temperature of  $20^\circ\text{C}$ . A piece of a metal of mass 96 g and temperature  $100^\circ\text{C}$  is dropped into water. If the final temperature of the system is  $25^\circ\text{C}$  and the specific heat capacities of water and aluminum are  $4200 \text{ J/kg.K}$  and  $900 \text{ J/kg.K}$ , respectively, then the specific heat capacity of the metal of the dropped piece equals.....

- (a)  $450 \text{ J/kg.K}$       (b)  $720 \text{ J/kg.K}$   
 (c)  $960 \text{ J/kg.K}$       (d)  $1440 \text{ J/kg.K}$

# Questions ?

## Unit 1 | Lesson 4

Answered

## Aqueous Solutions and their Properties

Interactive test



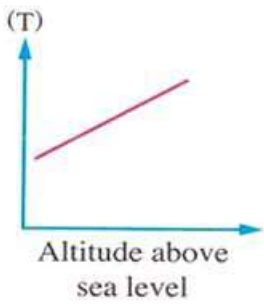
First

### Multiple Choice Questions

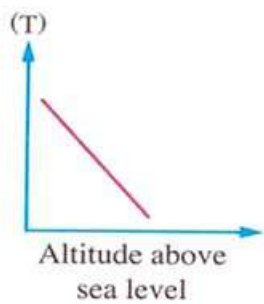
Questions signed by \* are answered in detail.

- 1 Which of the following expresses water in all water bodies on the Earth's surface?
  - (a) It exists in a pure form.
  - (b) It contains dissolved or suspended substances.
  - (c) It has the same temperature.
  - (d) It has the same degree of salinity.
- 2 Which of the following is from the colligative properties of aqueous solutions?
  - (a) Elevation of vapor pressure.
  - (b) Depression in boiling point.
  - (c) Elevation of freezing point.
  - (d) Osmotic pressure.
- 3 The colligative properties of aqueous solutions depend on .....
  - (a) nature of solvent
  - (b) nature of solute
  - (c) volume of solution
  - (d) number of solute molecules
- 4 What happens to the vapor pressure of an aqueous solution when increasing the concentration of the solute?
  - (a) It decreases.
  - (b) It increases.
  - (c) It isn't affected.
  - (d) It vanishes.
- 5 The liquid starts to boil when its vapor pressure is .....
  - (a) less than the pressure exerted on it
  - (b) greater than the pressure exerted on it
  - (c) equal to the pressure exerted on it
  - (d) double the pressure exerted on it
- 6 What happens to the vapor pressure of the liquid when its temperature increases in a closed system?
  - (a) It increases.
  - (b) It decreases.
  - (c) It isn't affected.
  - (d) It vanishes.
- 7 \* At the standard atmospheric pressure, if the boiling point of a pure solvent =  $X^{\circ}\text{C}$ , the boiling point of the solution that produced from dissolving one of its salts in it is .....
  - (a) equal to  $X^{\circ}\text{C}$
  - (b) greater than  $X^{\circ}\text{C}$
  - (c) less than  $X^{\circ}\text{C}$
  - (d) equal to  $\frac{1}{2} X^{\circ}\text{C}$

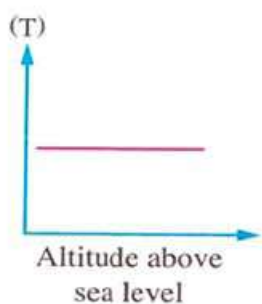


- 8 When does the liquid reach the dynamic equilibrium state?  
 (a) When the evaporation rate is higher than the condensation rate.  
 (b) When the evaporation rate is equal to the condensation rate.  
 (c) When the condensation rate is greater than the evaporation rate.  
 (d) When evaporation continues and condensation vanishes.
- 9 What are the consequences of using salt or sugar in preserving some beverages?  
 (a) Increasing the liquid vapor pressure. (b) Decreasing the liquid vapor pressure.  
 (c) Improving the taste only. (d) Decreasing the liquid boiling point.
- 10 Which of the following factors **doesn't** affect the boiling point of the solution?  
 (a) Atmospheric pressure. (b) Concentration of the solution.  
 (c) Volume of the solution. (d) The number of solute ions.
- 11 What is the effect of increasing the number of solute molecules in the solution on the solution boiling point and its osmotic pressure respectively?  
 (a) Increases / Increases. (b) Decreases / Decreases.  
 (c) Increases / Decreases. (d) Decreases / Increases.
- 12 Which of the following sugar solutions has the highest boiling point?  
 (a) Solution of concentration 10 g/L (b) Solution of concentration 5 g/L  
 (c) Solution of concentration 9 g/L (d) Solution of concentration 1 g/L
- 13 Which of the following graphs represents the relation between the boiling point of pure water (T) and the altitude above sea level?
- 

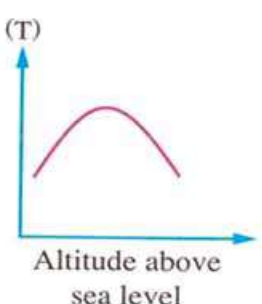
(a)



(b)

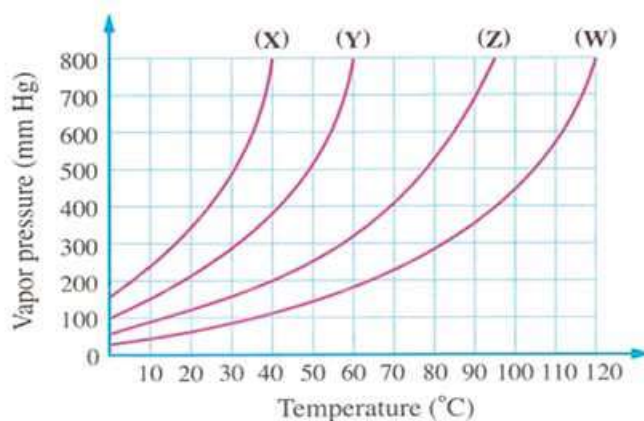


(c)



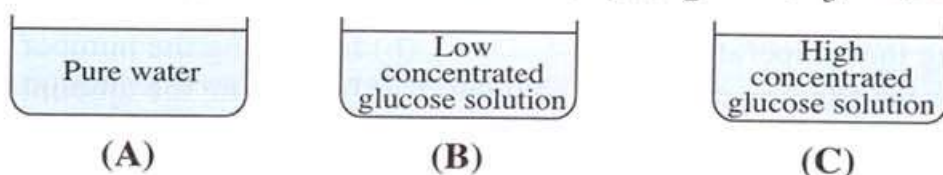
(d)
- 14 \* If the freezing point of a pure solvent is  $0^{\circ}\text{C}$ , what will be the freezing point if 5g of salt is dissolved in it?  
 (a) Less than  $0^{\circ}\text{C}$  (b) Higher than  $0^{\circ}\text{C}$  (c) Equals  $0^{\circ}\text{C}$  (d)  $0^{\circ}\text{C} : 4^{\circ}\text{C}$
- 15 If the boiling point of a solution at a mountaintop is  $108^{\circ}\text{C}$ , therefore the boiling point of the same solution on the Earth's surface is .....  
 (a)  $106^{\circ}\text{C}$  (b)  $104^{\circ}\text{C}$  (c)  $108^{\circ}\text{C}$  (d)  $110^{\circ}\text{C}$
- 16 What is the reason for the depression in the freezing point of an aqueous solution comparing to the freezing point of pure water?  
 (a) The attraction forces between the solute molecules and water molecules obstruct the freezing.  
 (b) Pure water contains a larger number of dissolved molecules.  
 (c) Dissolved salts in the solution reduce its osmotic pressure.  
 (d) Decreasing the vapor pressure of pure water.

- 17 Why are salts spread on roads in cold regions after rainfall?
- Due to the decrease in the freezing point of the salt solution.
  - Due to the increase in the freezing point of the salt solution.
  - Due to the increase in the vapor pressure of water.
  - Due to the decrease in the vapor pressure of water.
- 18 The solution is characterized from pure solvent by .....
- having low vapor pressure
  - the depression in the boiling point
  - the absence of osmotic pressure
  - the elevation of the freezing point
- 19 Which of the following its increase leads to decreasing the vapor pressure of solutions?
- Number of solvent molecules.
  - Number of solute molecules.
  - Temperature.
  - The amount of solution.
- 20 Which of the following statements is correct?
- The number of water vapor molecules that are released from solutions is less than that released from pure water under the same conditions.
  - Attraction forces among water molecules each other are stronger than the attraction forces between water molecules and solute molecules.
  - The vapor pressure value in solutions is greater than its value in case of pure water.
  - The depression in vapor pressure is inversely proportional to the number of solute ions in the solution.
- 21 \* The following solutions have equal concentrations, which of them has the least vapor pressure?
- NaCl
  - $\text{CuCl}_2$
  - $\text{Al}(\text{NO}_3)_3$
  - HCl
- 22 If the boiling point of acetic acid at 1 atm pressure equals  $118^\circ\text{C}$ , it is expected that its boiling point at 0.8 atm pressure equals .....
- $111^\circ\text{C}$
  - $118^\circ\text{C}$
  - $119^\circ\text{C}$
  - $125^\circ\text{C}$
- 23 \* The opposite graph expresses the relation between the vapor pressure of four pure liquids (X), (Y), (Z) and (W) at different temperatures, which liquid whose boiling point is the highest at standard atmospheric pressure?
- (X).
  - (Y).
  - (Z).
  - (W).





- 24 The probability of water molecules evaporation in solutions decreases compared to pure water due to .....
- increasing the attraction forces among water molecules
  - decreasing the attraction forces among water molecules
  - the presence of attraction forces between water and solute molecules
  - the absence of attraction forces between water and solute molecules
- 25 \* At higher altitudes above sea level, which of the following is correct about the boiling point of pure water?
- It decreases as the atmospheric pressure increases.
  - It decreases as the atmospheric pressure decreases.
  - It increases as the atmospheric pressure decreases.
  - It increases as the atmospheric pressure increases.
- 26 The boiling point of pure water inside the pressure cooking pot may be .....
- 125°C
  - 100°C
  - 90°C
  - 80°C
- 27 In which of the following cases does the boiling point of pure water decrease?
- Inside the pressure cooking pot.
  - When adding table salt to it.
  - At the top of a mountain.
  - When the atmospheric pressure increases.
- 28 Two solutions (X) and (Y) of the same salt, if the boiling point of solution (X) is higher than the boiling point of solution (Y), therefore .....
- the salt concentration in solution (X) is greater
  - the pressure on the surface of solution (X) is lower
  - the salt concentration in solution (Y) is greater
  - the pressure on the surface of solution (Y) is higher
- 29 The following figures represent three beakers (A), (B) and (C) containing equal amounts of liquids, if the boiling point of each of them is ( $T_1$ ), ( $T_2$ ) and ( $T_3$ ) respectively:



Which of the following relationships is correct?

- $T_1 > T_2 > T_3$
  - $T_1 < T_2 < T_3$
  - $T_1 = T_2 = T_3$
  - $T_2 < T_1 < T_3$
- 30 In which of the following cases does the pure water boil quickly before its temperature reaches 100°C?
- Being at the top of a mountain.
  - The presence in a low valley.
  - Being at sea level.
  - Putting water in a pressure cooking pot.

- 31 \* When comparing between two equal concentrations of  $\text{Al}_2(\text{SO}_4)_3$  and  $\text{Al}(\text{NO}_3)_3$  solutions, the boiling point and vapor pressure of aluminum sulphate solution according to aluminum nitrate solution are ..... and ..... respectively.  
 (a) lower - higher (b) higher - lower (c) higher - higher (d) lower - lower
- 32 \* The freezing point of a certain concentration from magnesium chloride solution ( $\text{MgCl}_2$ ) is ..... that of the same concentration from potassium nitrate solution ( $\text{KNO}_3$ ).  
 (a) greater than (b) less than  
 (c) equal to (d) no correct answer
- 33 By increasing the number of ions of the non-volatile dissolved substances in water, all of the following is correct **except** .....  
 (a) the vapor pressure decreases (b) the freezing point decreases  
 (c) the osmotic pressure decreases (d) the boiling point increases
- 34 On adding 50 mL pure water to 100 mL salt solution, then .....  
 (a) the boiling point of the solution decreases and its vapor pressure decreases  
 (b) the freezing point of the solution decreases and its boiling point increases  
 (c) the vapor pressure of the solution increases and its osmotic pressure increases  
 (d) the freezing point of the solution increases and its vapor pressure increases
- 35 Assuming that a liquid boils at  $90^\circ\text{C}$ , if it is exposed to high pressure, its boiling point can be .....  
 (a)  $82^\circ\text{C}$  (b)  $90^\circ\text{C}$  (c)  $110^\circ\text{C}$  (d)  $70^\circ\text{C}$
- 36 \* The following solutions are of equal concentrations, which of them has the highest freezing point?  
 (a)  $\text{NaCl}$  (b)  $\text{CaCl}_2$  (c)  $\text{Al}_2(\text{SO}_4)_3$  (d)  $\text{AlCl}_3$
- 37 What is the effect of increasing the number of solute molecules in a certain volume of pure water on each of the freezing and boiling points respectively?  
 (a) Increases / Increases. (b) Increases / Decreases.  
 (c) Decreases / Decreases. (d) Decreases / Increases.
- 38 Which of the following choices increases the osmotic pressure of a solution?  
 (a) Decreasing the temperature. (b) Increasing the number of solute ions.  
 (c) Decreasing the concentration of the solution. (d) Increasing the amount of solvent.
- 39 From the opposite table:  
 (1) What is the liquid whose vapor pressure is the highest at room temperature ( $25^\circ\text{C}$ )?  
 (a) Water. (b) Acetone.  
 (c) Acetaldehyde. (d) Acetic acid.  
 (2) What is the liquid whose vapor pressure is the least at room temperature ( $25^\circ\text{C}$ )?  
 (a) Water. (b) Acetone.  
 (c) Acetaldehyde. (d) Acetic acid.

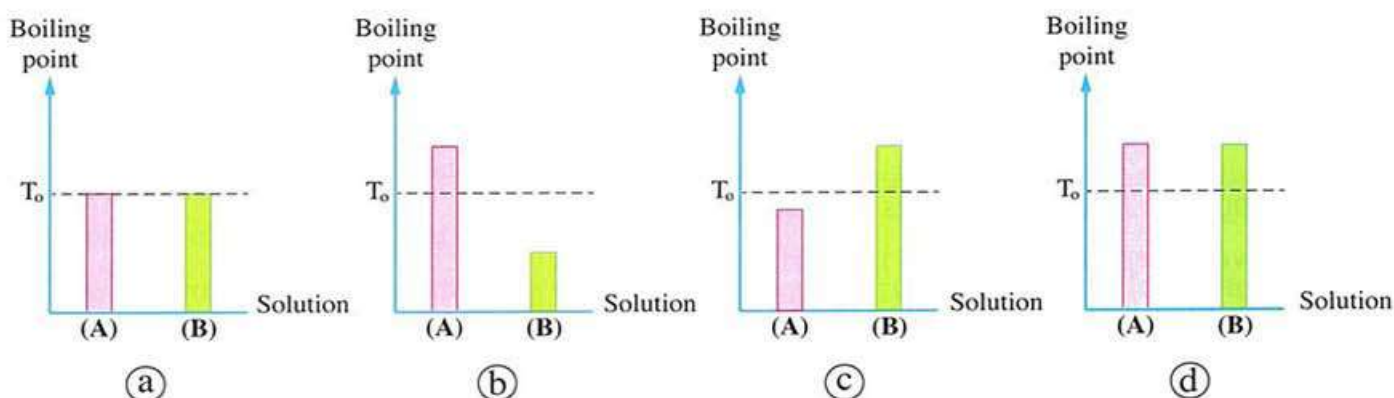
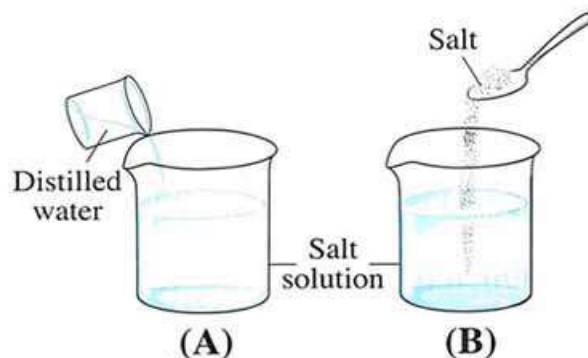
| Compound     | Boiling point ( $^\circ\text{C}$ )<br>at standard<br>atmospheric pressure |
|--------------|---------------------------------------------------------------------------|
| Water        | 100                                                                       |
| Acetone      | 56                                                                        |
| Acetaldehyde | 31                                                                        |
| Acetic acid  | 118                                                                       |



- 40 \* The boiling point of a liquid inside the pressure cooking pot is ..... its boiling point at atmospheric pressure of 0.5 atm.

(a) greater than (b) less than (c) equal to (d) half

- 41 \* In the opposite figure, there are two beakers containing two equal volumes of the same salt solution and its boiling point is ( $T_0$ ). If an amount of distilled water was added to beaker (A) and an amount of salt is added to beaker (B), which of the following graphs may express correctly the boiling point of the solution in the two beakers after the additions?

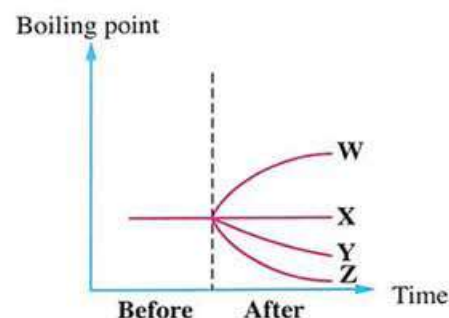


- 42 The boiling point of two amounts of pure water is measured at two different regions (A) and (B), if the boiling point of the amount of water at region (A) is higher than that at region (B). What is the ratio between the two values of the atmospheric pressures that exerted on the two amounts of water at regions (A) and (B) respectively?

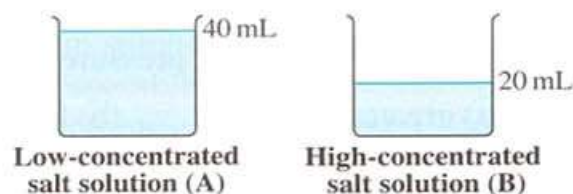
(a) Greater than one. (b) Less than one.  
(c) Equals one. (d) Can't be identified.

- 43 From the opposite figure, which of the following represents the change resulting from the addition of 25 g of sodium chloride to 200 mL of pure water during period of time?

(a) W (b) X  
(c) Y (d) Z

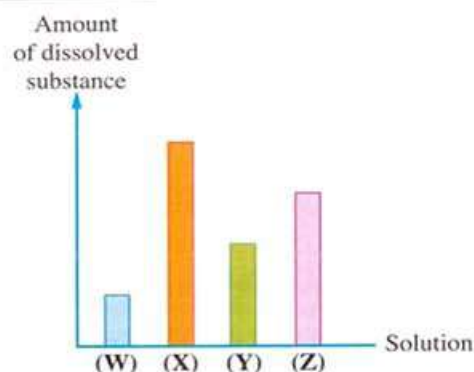


- 44 \* The opposite figure illustrates two samples of table salt solutions (A) and (B) with different concentrations, which of the following choices is correct when comparing the boiling point of solution (B) with the boiling point of solution (A)?



- (a) (B) is higher / As the volume of the solution is lower.  
 (b) The boiling point of the two solutions is equal.  
 (c) (B) is higher / As the concentration of the solution is higher.  
 (d) (A) is higher / As the volume of the solution is larger.
- 45 Which of the following represents a correct arrangement for the osmotic pressure of three water samples from different sources at 25°C?
- (a) Fresh water > Distilled water > Salt water.  
 (b) Fresh water = Distilled water > Salt water.  
 (c) Salt water > Fresh water > Distilled water.  
 (d) Salt water > Fresh water = Distilled water.

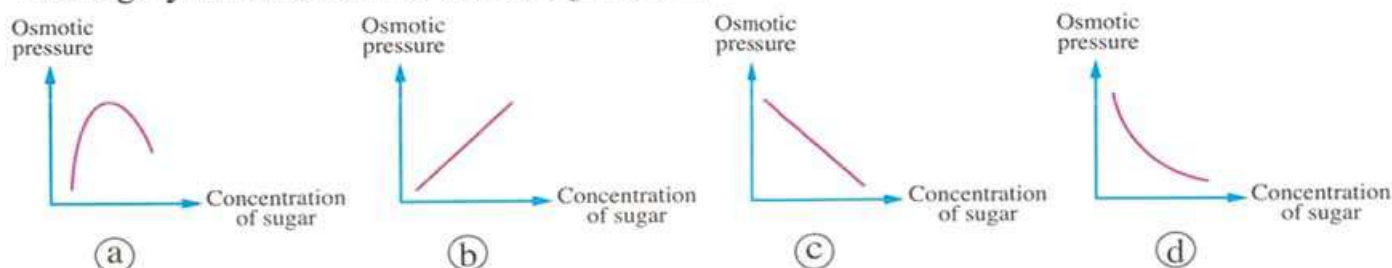
- 46 The opposite graph represents four solutions of equal volumes and dissolved in it different amounts of sodium chloride salt. Which of the following represents the arrangement of the solutions according to their osmotic pressure?



- (a)  $W > X > Y > Z$       (b)  $X > Z > Y > W$   
 (c)  $W > Y > Z > X$       (d)  $X > Y > Z > W$
- 47 Which of the following has the highest osmotic pressure?
- (a) Low-concentrated solution.      (b) High-concentrated solution.  
 (c) Pure liquid whose temperature is high.      (d) Pure liquid whose temperature is low.

- 48 As the osmotic pressure of the solution increases, its vapor pressure ..... .
- (a) vanishes      (b) increases      (c) decreases      (d) isn't affected

- 49 Which of the following graphs illustrates the relation between the concentration of sugar in a sugary solution and its osmotic pressure?





- 50 The difference between the osmotic pressure of two solutions leads to the diffusion of water through semi-permeable membrane from the solution that is characterized by ..... .
- (a) having high osmotic pressure
  - (b) having a high concentration of solute
  - (c) having low osmotic pressure
  - (d) having a low concentration of water

## Second Miscellaneous Questions

### 1 Write the scientific term for each of the following statements:

- (a) A homogeneous mixture of solvent and solute.
- (b) The properties of the solution that depend on the number of the non-volatile dissolved substance molecules or ions in the solution not on its type.
- (c) The vapor pressure of the liquid at the dynamic equilibrium between the liquid and its vapor.
- (d) The rate of liquid evaporation is equal to the rate of its vapor condensation at constant temperature and pressure at closed system.
- (e) The temperature at which the vapor pressure of the liquid is equal to the atmospheric pressure exerted on its surface.
- (f) The phenomenon of transferring the water molecules from a diluted solution to the concentrated solution through a semi-permeable membrane that separates between the two solutions.
- (g) The pressure that causes the transfer of water from low-concentrated solution to high-concentrated solution through semi-permeable membrane.

### 2 Give reasons for:

- (a) The vapor pressure of the solution is always lower than the vapor pressure of the pure solvent forming it.
- (b) The boiling point of the aqueous solution is higher than the boiling point of pure water at the standard atmospheric pressure.
- (c) Large amounts of salt are spread on roads in cold countries at rainfall.
- (d) The freezing point of the aqueous solution is always less than the freezing point of pure water.

### 3 What happens in each of the following cases:

- (a) The evaporation rate equals the condensation rate.
- (b) The vapor pressure of pure liquid equals the vapor pressure exerted on its surface.
- (c) Increasing the number of molecules of non-volatile dissolved substance in the solution "in terms of: the boiling and freezing points".

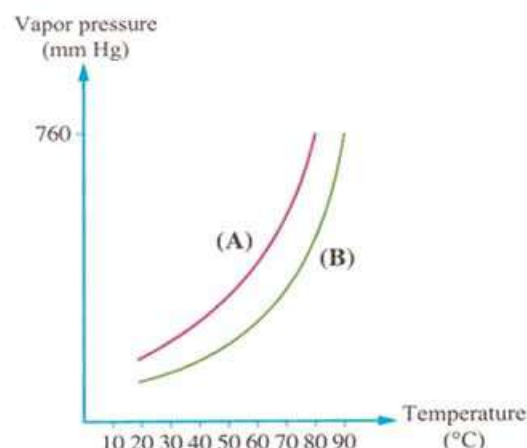
**4 Compare between each of the following:**

- (a) Pure water and aqueous solution "in terms of: the forces affecting the value of vapor pressure - the value of vapor pressure".
- (b) Boiling point of pure water when measured at mountaintop and inside a pressure cooking pot. **With explanation.**

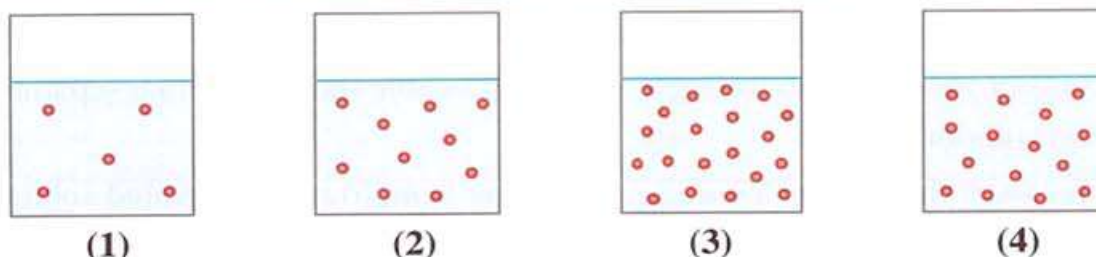
**5 What is meant by the colligative properties of the solution? With determining them.**

- 6** The opposite graph represents the relation between the vapor pressure and the temperature of two solutions (A) and (B) one of them is pure solvent and the other is solution. **Deduce** the symbol indicating each of the following:

- (a) Pure solvent.
- (b) Solution.

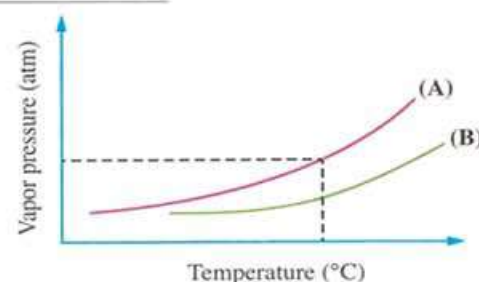


**7 The following figures express four closed containers, each of them contains an aqueous solution containing the same non-volatile solute at the same temperature:**



- (a) **Determine the number of the solution which has:**
  - (1) The highest vapor pressure.
  - (2) The highest boiling point.
- (b) **Arrange the solutions from (1) : (4) descendingly "according to: the freezing point".**

**8** The opposite graph expresses the relation between the vapor pressure and the temperature of two pure liquids (A) and (B), **which** of them has the highest boiling point? **With explanation.**



- 9** If you have two liquids (X) and (Y), liquid (X) evaporates faster than liquid (Y) at 30°C:
- (a) **Which** of the two liquids has the highest vapor pressure at 30°C?
  - (b) **Which** of the two liquids has the highest boiling point?

**10 What is the relation between the number of solute molecules in the solution and its osmotic pressure? With explanation.**

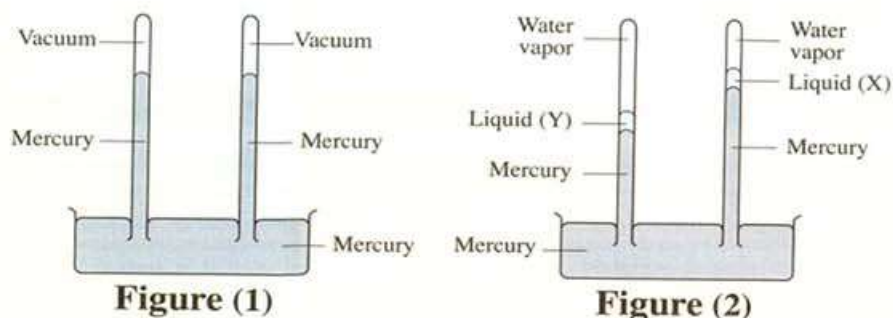


## Questions that measure high levels of thinking

Answered in detail

**Choose the correct answer:**

- 1 In the two opposite figures, two equal volumes of liquids (X) and (Y) were put in the two tubes of the apparatus illustrated in figure (1) each separately. So, the mercury level in the two tubes decreases as in figure (2), which of the following is correct?



- (a) (X) represents distilled water / (Y) represents NaCl solution.  
 (b) (X) represents river water / (Y) represents seawater.  
 (c) (X) represents NaCl solution / (Y) represents distilled water.  
 (d) (X) represents distilled water / (Y) represents ocean water.

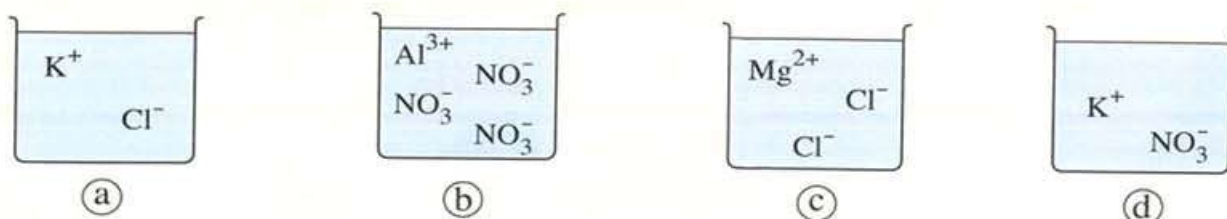
- 2 On measuring the boiling point of three identical samples of table salt solution:

|       |                                                                                |
|-------|--------------------------------------------------------------------------------|
| $T_1$ | Represents the boiling point of the solution at standard atmospheric pressure. |
| $T_2$ | Represents the boiling point of the solution at the top of a high mountain.    |
| $T_3$ | Represents the boiling point of the solution inside a pressure cooking pot.    |

Which of the following relations is correct?

- (a)  $T_1 > T_2 > T_3$   
 (b)  $T_3 > T_2 > T_1$   
 (c)  $T_2 > T_1 > T_3$   
 (d)  $T_3 > T_1 > T_2$

- 3 If the following solutions are of equal concentration, which of them has the least freezing point?



- 4 If the vapor pressure of a liquid is equal to (X) and the atmospheric pressure exerted on it is (1.5 X), then the liquid .....

- (a) boils  
 (b) volume increases  
 (c) freezes  
 (d) doesn't reach the boiling point

# Questions ?

Unit

1

## Lesson 5

Answered

## Biological Importance of Water

Interactive  
test



First

### Multiple Choice Questions

Questions signed by \* are answered in detail.

#### Cell

- 1 Which of the following **isn't** applied to the cell?
  - (a) It is the structural unit of the living organism.
  - (b) It is the functional unit of the living organism.
  - (c) It is the smallest independent constituent in the living organism.
  - (d) Its structure is similar in all living organisms.
- 2 Which of the following living organism(s) its/their cell wall contains peptidoglycan substance?
  - (a) Clams.
  - (b) Bacteria.
  - (c) Yeast.
  - (d) Bean plant.
- 3 Which of the following **doesn't** belong to eukaryotes?
  - (a) Corn plant.
  - (b) Sponge.
  - (c) Jellyfish.
  - (d) Bacteria.
- 4 Which of the following statements **isn't** applied to bacteria?
  - (a) They are prokaryotes.
  - (b) Their genetic material is surrounded by a nuclear membrane.
  - (c) Their cell walls contain peptidoglycan substance.
  - (d) They are unicellular organisms.
- 5 All eukaryotes are similar in containing .....
  - (a) large vacuole
  - (b) mitochondria
  - (c) cell wall
  - (d) chloroplasts
- 6 Which of the following kingdoms whose organisms are often aquatic?
  - (a) Protista.
  - (b) Fungi.
  - (c) Plantae.
  - (d) Animalia.
- 7 Fungi and protozoa are similar in that all of them .....
  - (a) contain cell wall
  - (b) are heterotrophic
  - (c) are aquatic
  - (d) are unicellular
- 8 The cell wall in fungi consists of .....
  - (a) peptidoglycan
  - (b) cellulose
  - (c) chitin
  - (d) pectin



- 9 All the following are heterotrophic organisms, **except** .....  
 (a) protozoa (b) yeast fungus (c) golden algae (d) starfish
- 10 Which of the following kingdoms all its organisms are autotrophic?  
 (a) Protista. (b) Plantae. (c) Animalia. (d) Fungi.
- 11 Which of the following is a characteristic of kingdom Animalia?  
 (a) All its organisms are unicellular.  
 (b) All its organisms are autotrophic.  
 (c) Most of its organisms are capable to move.  
 (d) Most of its organisms are prokaryotes.
- 12 Which of the following living organisms has no backbone?  
 (a) Tilapia fish. (b) Frog. (c) Honey bee. (d) Plover.
- 13 Which of the following organisms belongs to coelenterates?  
 (a) Jellyfish. (b) Starfish. (c) Sponge. (d) Clam.
- 14 All the following are from vertebrates, **except** .....  
 (a) fish (b) amphibians (c) reptiles (d) arthropods
- 15 Insects belong to .....  
 (a) coelenterates (b) arthropods  
 (c) mollusks (d) echinoderms

### Cell structure in eukaryotes

- 16 Which of the following are common between plant cells, fungi and bacteria?  
 (a) Cell wall and plasma membrane.  
 (b) Cell wall and sap vacuoles.  
 (c) Mitochondria and chloroplasts.  
 (d) Sap vacuoles and chloroplasts.
- 17 Which of the following structures exist(s) in all living cells?  
 (a) Nuclear membrane. (b) Chloroplasts.  
 (c) Cell wall. (d) Plasma membrane.
- 18 Which of the following are found in both of a human skin cell and a cell of a corn plant leaf?  
 (a) Nucleus and cytoplasm. (b) Plasma membrane and large vacuole.  
 (c) Nucleus and plastid. (d) Plasma membrane and cell wall.
- 19 Which of the following is from the chloroplasts functions in the plant cell?  
 (a) Performing photosynthesis process.  
 (b) Transport inside the cell.  
 (c) The breakdown of glucose and energy production.  
 (d) Water storage.

- 20** Which of the following most of it consists of water?  
 (a) Cell wall. (b) Mitochondria. (c) Nucleus. (d) Cytoplasm.
- 21** Which of the following structures has a transport function inside the living cell?  
 (a) Endoplasmic reticulum. (b) Mitochondria.  
 (c) Chloroplast. (d) Sap vacuole.
- 22** Which of the following cells contains a large sap vacuole?  
 (a) A cell in bean plant. (b) Bacterial cell. (c) Fungal cell. (d) Hepatic cell.
- 23** Which of the following organelles has a storage function inside the living cell?  
 (a) Mitochondria. (b) Vacuole.  
 (c) Chloroplast. (d) Endoplasmic reticulum.

**24** The opposite figure shows a plant cell, study it, then answer:

**(1)** Which of the following represents the energy-production centers in the cell?

- (a) (1). (b) (2).  
 (c) (3). (d) (4).

**(2)** Which of the following structures contains the genetic material?

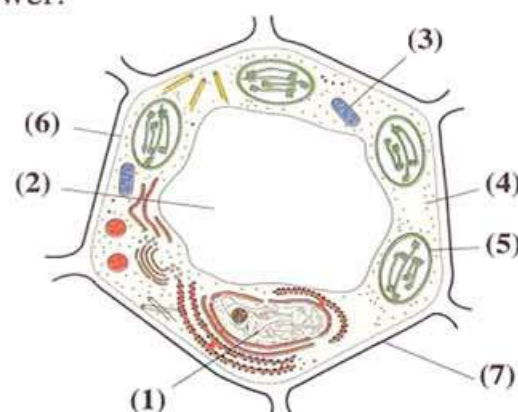
- (a) (1). (b) (2).  
 (c) (1) & (6). (d) (2) & (4).

**(3)** Which of the following structures regulates the passage of substances from and to the cell?

- (a) (2). (b) (5). (c) (6). (d) (7).

**(4)** Which structure is considered a gel-like substance in the cell?

- (a) (1). (b) (4). (c) (5). (d) (7).



**25** The figure in front of you illustrates an animal cell, study it, then answer:

**(1) \*** Which of the following structures whose number decreases in the plant cell?

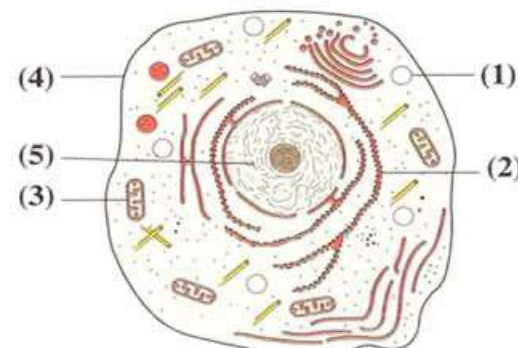
- (a) (1). (b) (2).  
 (c) (4). (d) (5).

**(2)** Which of the following structures consists of a group of membranes?

- (a) (1). (b) (2).  
 (c) (3). (d) (4).

**(3)** Which of the following structures controls the living cell activities?

- (a) (1). (b) (2). (c) (3). (d) (5).





- 26 Which of the following structures is usually located at the center of the animal cell?  
 (a) Nucleus. (b) Vacuole. (c) Mitochondria. (d) Plastid.

### Water in living cells

- 27 From the inorganic molecules is/are .....  
 (a) carbohydrates (b) water (c) proteins (d) lipids
- 28 In mammals, the percentage of water is about ..... % of the organism's body mass.  
 (a) 23 (b) 47 (c) 70 (d) 90
- 29 The percentage of water in blood plasma and other body fluids in mammals is about ..... % of the body mass.  
 (a) 23 (b) 47 (c) 70 (d) 83
- 30 The percentage of water inside the mammal cells is about ..... % of the organism's body mass.  
 (a) 23 (b) 47 (c) 60 (d) 80
- 31 Which of the following directly participate(s) in all the metabolic processes?  
 (a) Mineral salts. (b) Water.  
 (c) Lipids. (d) Carbohydrates.

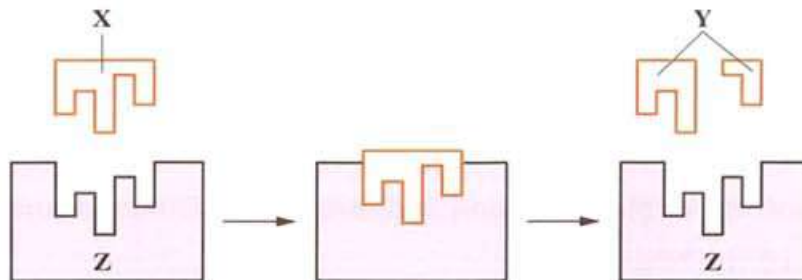
### Metabolism

- 32 Which of the following statements expresses a characteristic feature of the catabolic process ?  
 (a) It aims to store energy inside the cell till using it.  
 (b) It takes place in plant cells, but it doesn't take place in animal cells.  
 (c) The energy required for performing the vital functions of the cell is obtained through it.  
 (d) It takes place in animal cells, but it doesn't take place in plant cells.
- 33 Which of the following is applied to anabolic and catabolic processes respectively?  
 (a) Oxidation process / Reduction process.  
 (b) Consuming energy / Producing energy.  
 (c) Producing energy / Consuming energy.  
 (d) Breaking down of chemical bonds / Formation of chemical bonds.
- 34 Glucose sugar is broken down inside the cell through a process called .....  
 (a) excretion (b) digestion  
 (c) cellular respiration (d) photosynthesis

35 Which of the following are from the products of the glucose breakdown?

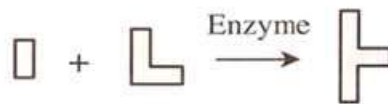
- (a)  $O_2$  & Energy. (b)  $O_2$  & Water.  
(c)  $CO_2$  &  $O_2$  (d) Water &  $CO_2$

36 The following figures represent a model for the action mechanism of an enzyme inside the human body, which of the following represents letters (X), (Y) and (Z) respectively?



- (a) Enzyme / Products / Substrate. (b) Enzyme / Substrate / Products.  
(c) Substrate / Enzyme / Products. (d) Substrate / Products / Enzyme.

37 The following figures represent a chemical reaction:



Which of the following figures represents the enzyme in this reaction?



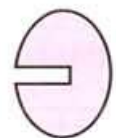
(a)



(b)

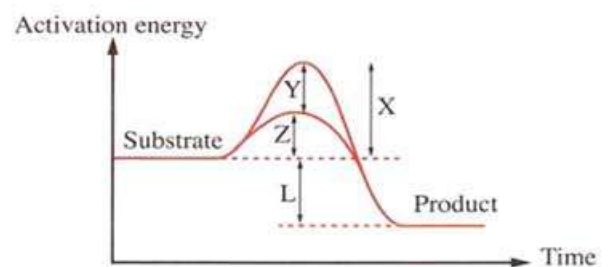


(c)



(d)

38 \* From the opposite graph that shows the effect of the enzyme on the activation energy of a chemical reaction. Which of the following represents the arrow that illustrates the reduction in the activation energy, due to the addition of an enzyme?



- (a) X (b) Y (c) Z (d) L

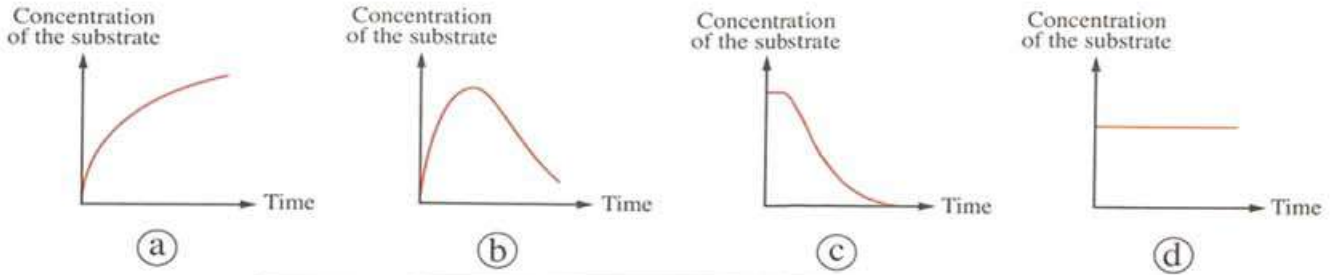
39 The opposite figure represents one of the enzyme's properties, what is this?

- (a) Participating in the reactions without being consumed.  
(b) Increasing the reaction speed.  
(c) Specializing in the combination with a certain substance.  
(d) Decreasing the activation energy.





- 40 \* Which of the following graphs shows the concentration of the substrate on adding the enzyme to it?



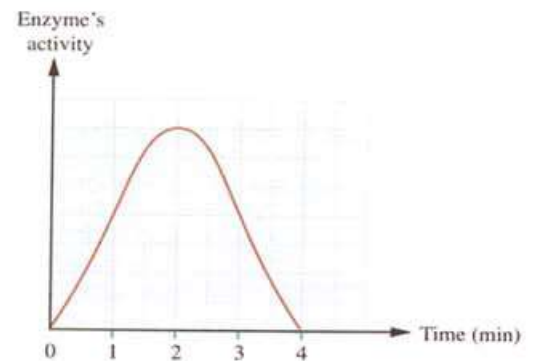
- 41 Which of the following factors leads to slowing down the action of the enzyme directly?

- (a) Changing the pH value to its optimum for its action.
- (b) Increasing the temperature greater than that is optimum for its action.
- (c) Increasing the molecules of substrate.
- (d) Increasing the enzyme's molecules.

- 42 The opposite graph represents the change in the enzyme's activity throughout a certain period of time, study it, then determine:

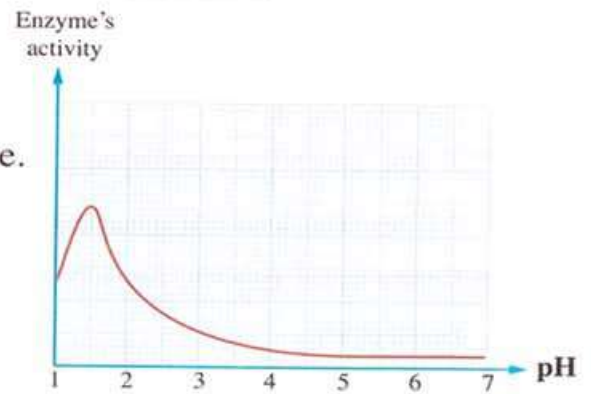
Which of the following statements is **not** correct?

- (a) The enzyme amount doesn't change during the period from (0) : (4).
- (b) The reaction products increase at minute (4).
- (c) The enzyme's activity increases at the period from (2) : (4).
- (d) The highest concentration of reactants is at time (0).

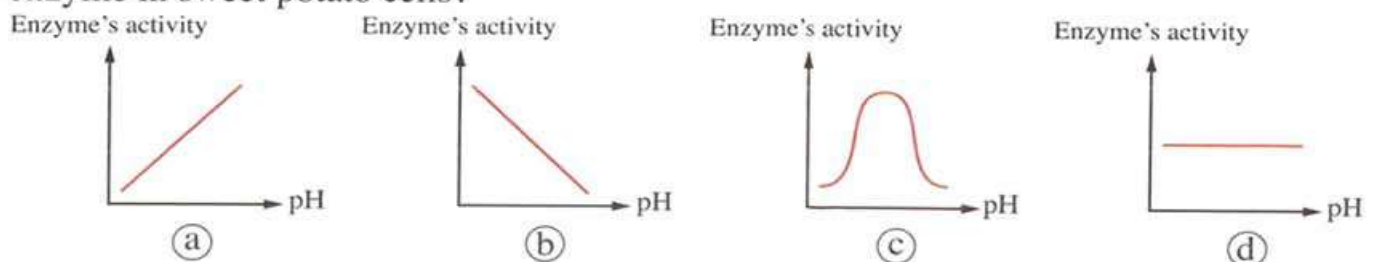


- 43 The opposite graph shows the relation between the pH value and the activity of an enzyme, which of the following statements could be concluded?

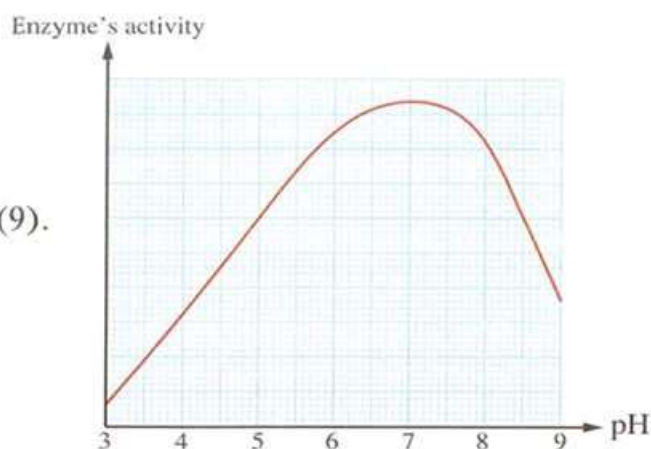
- (a) This enzyme is not affected by the medium's type.
- (b) This enzyme works with a maximum efficiency in the acidic medium.
- (c) This enzyme works with a maximum efficiency in the neutral medium.
- (d) This enzyme works with a maximum efficiency in the alkaline medium.



- 44 Which of the following graphs represents the effect of pH on the action of catalase enzyme in sweet potato cells?



- 45 From the opposite graph that illustrates the effect of pH on the activity rate of an enzyme, which of the following can be concluded?
- (a) The enzyme is consumed when pH reaches (9).
  - (b) The enzyme works with the highest efficiency at pH = 6
  - (c) The rate of the enzyme's activity decreases to half, when pH changes from (5) : (7).
  - (d) The rate of the enzyme's activity is equal at pH values (5) and (8.5).



- 46 Which of the following is considered the reason for the constancy of the reaction rate after a while from the beginning of the reaction in the presence of the enzyme?
- (a) The increase of the enzyme concentration.
  - (b) The saturation of the enzyme active sites with substrate.
  - (c) The increase of the substrate concentration.
  - (d) The increase in the active sites number of the enzyme.

## Second Miscellaneous Questions

### 1 Write the scientific term for each of the following statements:

- (a) The most abundant chemical substance in living organisms and all vital processes depend on it.
- (b) \* The structural and functional unit of all living organisms.  
\* The smallest independent constituent in the structure of the multicellular organism.
- (c) Unicellular organisms whose genetic material isn't surrounded by a nuclear membrane.
- (d) Living organisms whose genetic material is surrounded by a nuclear membrane and contain specialized organelles.
- (e) A thin semi-permeable membrane separates between the living cell components and its surrounding environment.
- (f) A gel-like substance consists mostly of water and contains some chemical substances.
- (g) Specific catalysts or activators increase the speed of the chemical reactions in the cell.
- (h) A set of continuous biochemical reactions that occur inside the living organism's cells.
- (i) The minimum amount of energy required to start the chemical reaction.



## 2 Give reasons for:

- (a) Bacteria belong to prokaryotes.
- (b) Protozoa belong to eukaryotes.
- (c) The cell wall of bacteria is characterized by containing peptidoglycan substance.
- (d) \* Nucleus determines the traits of the living organism.  
\* Nucleus controls the living cell activities.
- (e) Cytoplasm has an important role in the survival of the living cell.
- (f) Chloroplasts have an important role in performing the photosynthesis process.
- (g) Water acts as a universal solvent in the living cell.
- (h) The stability of the internal temperature of living organisms, despite the external fluctuations.
- (i) \* Water has a role in keeping the internal balance of the body.  
\* Water has a role in supporting the complex chemical activities in the cell.
- (j) Enzymes are similar with chemical catalysts.
- (k) Enzymes are specific proteins.

## 3 What happens in each of the following cases:

- (a) The absence of chloroplasts in the cells of bean plant.
- (b) The absence of plasma membrane in the living cell.
- (c) The decrease of water specific heat inside cells.
- (d) The absence of enzymes in living cells.
- (e) The increase of temperature above the optimal temperature for the enzyme's action.
- (f) The increase of pH value higher than the optimal pH for the enzyme's action.

## 4 Compare between each of the following:

- (a) Bacteria and fungi, "**in terms of:** the structure of the cell wall".
- (b) Prokaryotes and eukaryotes, "**in terms of:** the number of cells from which the living organism is formed – site of genetic material".
- (c) Kingdom Fungi and kingdom Plantae, "**in terms of:** the number of cells from which the living organism is formed – the structure of the cell wall – mode of nutrition".
- (d) Cell wall and plasma membrane, "**in terms of:** description – function – location".
- (e) Vacuoles in the plant cell and vacuoles in the animal cell.
- (f) Catabolism and anabolism.

## 5 The structure of cell wall in different kingdoms of eukaryotes is different. Explain this by giving examples.

## 6 "Cytoplasm contains cell organelles only". How far is this statement correct? With explanation.

## 7 "The sites of water inside and outside the mammal cells are different". Explain this statement.

- 8 What is the importance of water in the living organism's cells?
- 9 "Metabolic processes occur in plant cells only". **How far is this statement correct?**  
With explanation.

## Questions that measure **high levels of thinking**

Answered in detail

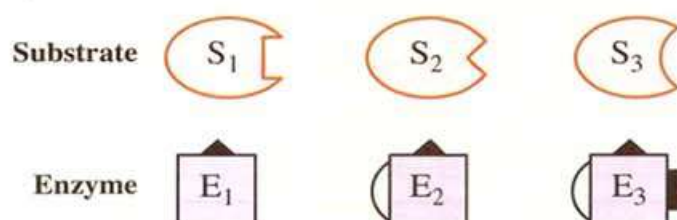
### Choose the correct answer:

- 1 Which of the following do you expect its/their presence is abundant in the birds' muscular cells?
- (a) Endoplasmic reticulum. (b) Mitochondria.  
(c) Plasma membrane. (d) Vacuoles.
- 2 The following diagram expresses two processes (1) and (2) that occur in a plant cell:



What do these processes represent?

- (a) (2) is catabolism and (1) is anabolism. (b) (1) is catabolism and (2) is anabolism.  
(c) Both (1) and (2) are catabolism. (d) Both (1) and (2) are anabolism.
- 3 Study the following figures, then answer:



Which of the following statements is correct about the enzymes that are present in the figure?

- (a)  $E_1$  is less specific than  $E_3$  (b)  $E_1$  is more specific than  $E_3$   
(c)  $E_2$  is less specific than  $E_3$  (d) All these enzymes are highly specific.
- 4 If an enzyme is extracted from a type of bacteria that live in hot acidic springs whose temperature reaches up to  $90^\circ\text{C}$ , which of the following reasons leads to the stopping of the enzyme action?
- (a) Increasing the substrate concentration.  
(b) Increasing the enzyme concentration.  
(c) Increasing the medium pH  
(d) Decreasing the surrounding temperature to  $80^\circ\text{C}$



# كيفية طباعة صفحات معينة من ملف معين

## مثلا ازاي نطبع الصفحات من صفحة 4 الى صفحة 9



حمل الآن

مجاناً وحصرياً

# المراجعة رقم (2)

اختبار شهر اكتوبر







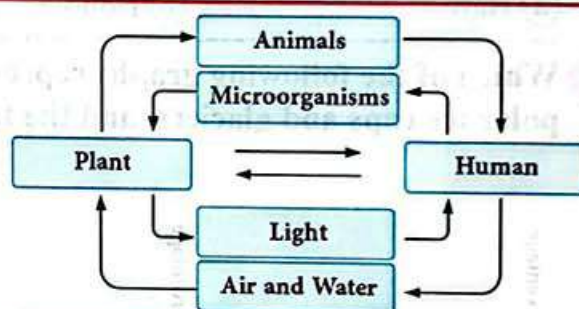
Questions marked with  are answered with explanations

## First Multiple Choice Questions

- 1 Which of the following correctly expresses the environment?
- (I) Includes biotic and abiotic factors and the mutual relationships among them  
 (II) A system composed of chemical, physical, and biological separated elements  
 (III) Influenced by a set of variables surrounding humans and living organisms
- (a) (II), (I) only    (b) (III), (I) only    (c) (III), (II) only    (d) (III), (II), (I)

- 2 Which of the following does the opposite figure correctly represent?

- (a) The environment as an integrated system  
 (b) The biotic factors of the environment  
 (c) The abiotic factors of the environment  
 (d) The separation of the components of the environment



- 3 The following figures represent examples of .....



- (a) Similar types of ecosystems    (b) Different types of ecosystems  
 (c) Similar types of spheres of one ecosystem    (d) Different types of spheres of one ecosystem

- 4 The natural environment consists of four spheres .....

- (a) Interconnected, influenced by human activities but do not affect them  
 (b) Interconnected and in a state of continuous change  
 (c) Not interconnected and in a state of continuous change  
 (d) Not interconnected, influenced by human activities, and affect them

- 5 The environment includes biotic factors such as humans, animals, and plants, and abiotic factors such as air and water.

The above paragraph contains the types of Earth's spheres except .....

- (a) The hydrosphere    (b) The biosphere    (c) The atmosphere    (d) The lithosphere



Which of the following figures represents the correct distribution of land and water on Earth's surface?



(a)



(b)



(c)

Land  
Water



(d)

Water covers ..... of Earth's surface, and ..... water represents 97% of this water.

(a) 30% – fresh

(b) 50% – salt

(c) 70% – salt

(d) 70% – fresh

The proportion of fresh water found in rivers, freshwater lakes, and groundwater is ..... the proportion found in ice in polar regions, mountain peaks, and glaciers.

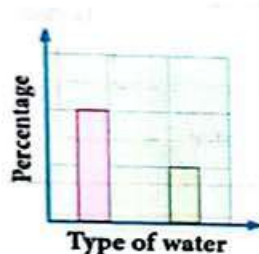
(a) Half

(b) Double

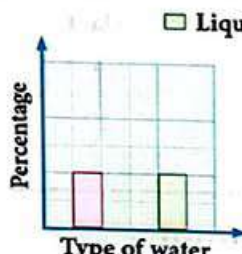
(c) One-fourth

(d) Three times

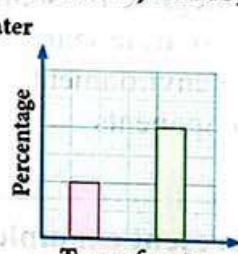
Which of the following graphs represents the ratio between the amount of water found in polar ice caps and glaciers, and the freshwater in rivers, lakes, and groundwater?



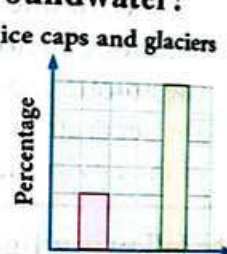
(a)



(b)



(c)



(d)

The Earth is distinguished from the other planets by the presence of .....

(a) The lithosphere

(b) The hydrosphere

(c) The atmosphere

(d) Heavy metals

Water exists in nature in the three states of matter. Which of the following represents the states of water present in the following spheres?

|     | Atmosphere       | Hydrosphere              |
|-----|------------------|--------------------------|
| (a) | Vapor only       | Liquid and solid         |
| (b) | Vapor and liquid | Vapor, liquid, and solid |
| (c) | Vapor only       | Vapor, liquid, and solid |
| (d) | Vapor and liquid | Liquid and solid         |

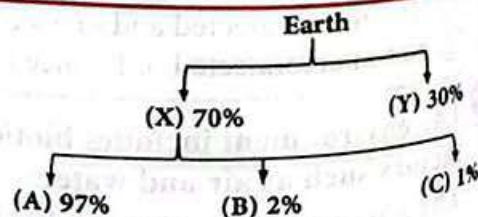
Study the opposite schematic figure that represents the distribution of Earth's landforms, then determine: Which of the following statements is correct?

(a) (X): Hydrosphere, (C): Frozen water

(b) (X): Hydrosphere, (B): Frozen water

(c) (A): Salt water, (Y): Liquid fresh water

(d) (B): Liquid fresh water, (Y): Atmosphere



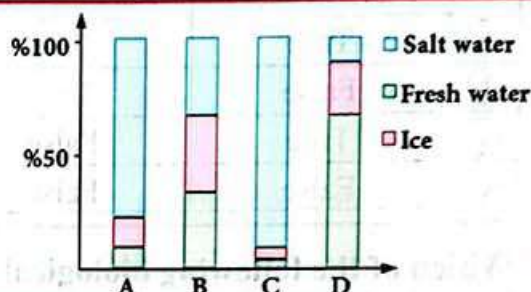


13 Which of the following represents the hydrosphere on Earth?

- (a) Represents more than  $\frac{3}{4}$  of the Earth's surface
- (b) Represents more than  $\frac{2}{3}$  of the Earth's surface
- (c) Represents more than three times the land area on Earth's surface
- (d) Represents less than twice the land area on Earth's surface

14 Study the opposite graph, then determine:  
Which of the columns shown in the figure represents the correct distribution of water on Earth's surface?

- (a) A
- (b) B
- (c) C
- (d) D



15 The water directly suitable for human consumption represents ..... of the hydrosphere on Earth's surface.

- (a) 97%
- (b) 2%
- (c) 1%
- (d) 99%

16 Which of the following processes in the water cycle (hydrological cycle) is represented by transpiration in plants?

- (a) Surface runoff
- (b) Water infiltration
- (c) Evaporation
- (d) Condensation

17 Water can move from the hydrosphere to the atmosphere through the process of .....

- (a) Evaporation
- (b) Condensation
- (c) Precipitation
- (d) Freezing

18 All of the following increase the percentage of water in the atmosphere except .....

- (a) Transpiration in plants
- (b) Respiration in humans
- (c) Evaporation of water from surfaces
- (d) Infiltration of water into rock pores

19 Which of the following statements best describes the role of plants in the hydrological cycle (water cycle)?

- (a) Plants prevent the loss of water from the Earth's surface and reduce the return of water to the atmosphere
- (b) Plants contribute to transpiration, which increases the water vapor content in the air
- (c) Plants reduce the amount of water infiltrating underground because they consume it entirely
- (d) Plants obstruct the movement of water vapor and prevent cloud formation

20 From your study of the opposite figure that shows the water cycle in nature, examine it carefully, then answer the following:

What does process (X) represent?

- (a) Transpiration
- (b) Evaporation
- (c) Precipitation
- (d) Condensation





- 21 Study the following two statements:

Statement (1): The hydrological cycle is a system capable of changing the Earth's surface physically, chemically, and biologically.

Statement (2): The water cycle involves the three physical states of water (solid – liquid – vapor).

Which of the following is correct?

|     | Statement (1) | Statement (2) |
|-----|---------------|---------------|
| (a) | True          | True          |
| (b) | False         | True          |
| (c) | True          | False         |
| (d) | False         | False         |

- 22 Which of the following biological processes distinguishes plants from humans in the hydrological cycle?

(a) Transpiration      (b) Respiration      (c) Excretion      (d) Digestion

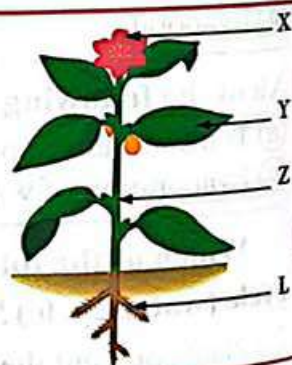
- 23 The transformation of water from the liquid state to the gaseous state during the water cycle occurs through .....

(a) Abiotic natural phenomena only  
 (b) Biological processes from plants only  
 (c) Abiotic natural phenomena and biological processes from plants  
 (d) Abiotic natural phenomena and biological processes from plants and animals

- 24 Study the opposite figure, then answer:

Which parts of the opposite plant mainly contain stomata?

(a) Y only  
 (b) Y, Z  
 (c) Z, X  
 (d) Y, L



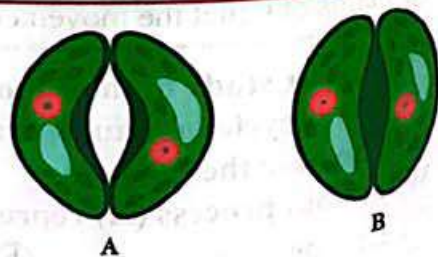
- 25 What type of rocks does water infiltrate through after rainfall to form groundwater?

(a) Igneous rocks      (b) Sedimentary rocks      (c) Metamorphic rocks      (d) Volcanic rocks

- 26 Study the opposite figure showing two states of microscopic stomata in plants, then determine:

Which of the two states causes the ascent (upward movement) of water and salts from the root to the upper parts of the plant?

(a) State (A) only      (b) State (B) only  
 (c) Both states (A) and (B)      (d) Neither of them





**27** Which of the following represents the correct sequence of transpiration water movement in plants?

- (a) Stomata → Roots → Xylem tissue  
(b) Roots → Xylem tissue → Stomata  
(c) Xylem tissue → Roots → Stomata  
(d) Roots → Stomata → Xylem tissue

**28** Transpiration in plants functions to .....

- (I) Lower the temperature of the plant body  
(II) Create a force opposing gravity to pull water and salts upward through the phloem tissue  
(III) Eliminate excess water in the form of water vapor

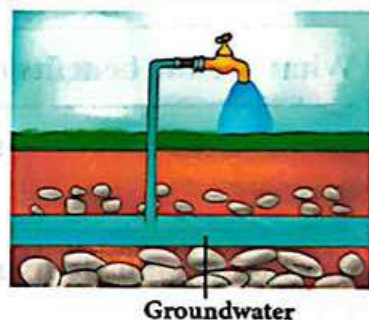
- (a) (II), (I) only  
(b) (III), (I) only  
(c) (III), (II) only  
(d) (III), (II), (I)

**29** Which of the following biological processes does the organism use to eliminate nitrogenous wastes resulting from metabolism

- (a) Transpiration in plants and animals  
(b) Transpiration in plants only  
(c) Excretion in plants and animals  
(d) Excretion in animals only

**30** Which of the following represents a correct pathway for the formation of water shown in the opposite figure within the hydrological cycle?

- (a) Mediterranean Sea – Clouds – Water vapor – Rain – Sedimentary rocks  
(b) Mediterranean Sea – Water vapor – Clouds – Rain – Sedimentary rocks  
(c) Mediterranean Sea – Water vapor – Clouds – Rain – Igneous rocks  
(d) Water vapor – Mediterranean Sea – Clouds – Rain – Metamorphic rocks



## Second Essay Questions

**31** Write the scientific term that refers to the following statements:

- (1) A community of living organisms that interact with each other and with the nonliving components in order to adapt to changing conditions.
- (2) One of Earth's spheres that covers 70% of the planet's surface.
- (3) Continuous change among the three states of water on Earth's surface within a closed system.
- (4) A process by which the plant eliminates water through the stomata.
- (5) A type of water formed as a result of water infiltration through sedimentary rocks.

**32** Give reasons for the following:

- (1) The water cycle in nature is a system capable of changing the Earth's surface physically, chemically, and biologically.
- (2) The water cycle in nature is considered a closed system.
- (3) Groundwater is formed in the hydrological cycle.
- (4) Transpiration is very important for the plant.
- (5) Excretion is very important for living organisms.

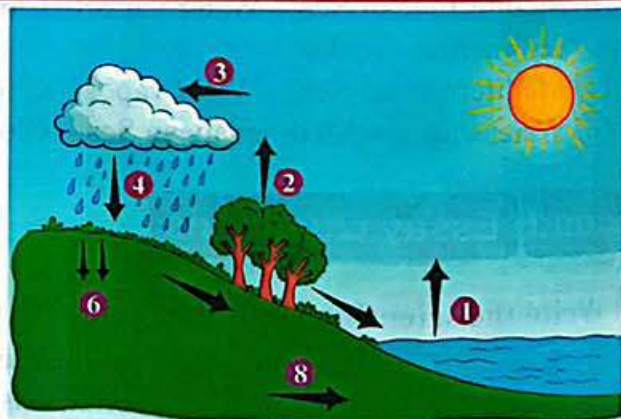


**33 Correct the mistake in the following statements:**

- (1) The natural environment consists of three interconnected spheres.
- (2) The lithosphere distinguishes Earth from the other planets.
- (3) The water cycle in nature is considered an isolated system in which water constantly moves from one place to another through several pathways.
- (4) The process of precipitation contributes to the formation of clouds in the hydrological cycle.
- (5) Water and salts ascend (move up) from the roots of plants to the stem and leaves through the phloem tissue.

**34 The sun and Earth's gravity are the main driving forces in the hydrological cycle. Explain this statement.**
**35 What spheres make up the natural environment?**
**36 What is the difference between precipitation and infiltration in the hydrological cycle?**
**37 Plants release water vapor through three biological processes. State these processes.**
**38 What are the benefits of transpiration for plants?**
**39 In the process of excretion, living organisms eliminate different types of wastes. Explain this.**
**40 Study the opposite figure carefully, then answer:**

- (a) What does the opposite figure represent?
- (b) Which arrows represent the process of condensation?
- (c) Which arrows represent biological processes?
- (d) Which arrows represent the process of precipitation?


**All rights reserved**

The authors and those responsible for this book do not permit any library, tutoring center, teacher, or student to reproduce or transfer any part of the book by any means, whether in print or in PDF format, for commercial purposes or personal use, even if it is only a single copy.

Such actions cause significant harm to the authors and those responsible for the book, given the great effort, time, and financial costs required to prepare it. Accordingly, all necessary legal actions will be taken in accordance with the provisions of Intellectual Property Law No. 82 of 2002 to ensure and protect intellectual property rights.





Questions marked with  are answered with explanations

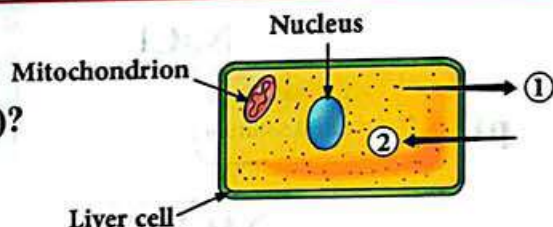
## First Multiple Choice Questions

### The unique properties of water

- 1 Study the following statements, then choose: which of them expresses the unique properties of water?
- (I) Water has the ability to dissolve many chemical substances.  
 (II) Water always exists in liquid form at the known temperatures on the Earth's surface.  
 (III) Water passes through the plasma membrane of all cell of living organisms.
- (a) (I), (II) only      (b) (I), (III) only      (c) (II), (III) only      (d) (I), (II), (III)

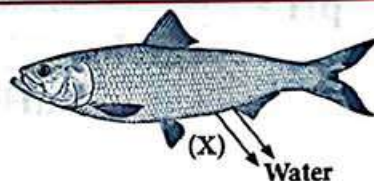
- 2 The opposite diagram represents the structure of a living cell. Study it well, then answer, What is the main purpose of the passage of water in direction (2)?

- (a) Transport of nutrients and oxygen  
 (b) Removal of wastes  
 (c) Regulation of temperature  
 (d) Transport of carbon dioxide gas



- 3 What is the main purpose of water coming out in direction (X) in the diagram?

- (a) Energy production      (b) Elimination of nitrogenous wastes  
 (c) Release of oxygen gas      (d) Increasing temperature



### The chemical composition of water

- 4 (1) In the opposite water molecule, the mass percentage of hydrogen is ..... (Given that the atomic mass of H = 1, O = 16)

- (a)  $\frac{100}{3}\%$       (b)  $\frac{200}{3}\%$       (c)  $\frac{100}{9}\%$       (d)  $\frac{800}{9}\%$

- (2) In the opposite water molecule, the mass percentage of oxygen is ..... (Given that the atomic mass of H = 1, O = 16)

- (a)  $\frac{100}{3}\%$       (b)  $\frac{200}{3}\%$       (c)  $\frac{100}{9}\%$       (d)  $\frac{800}{9}\%$



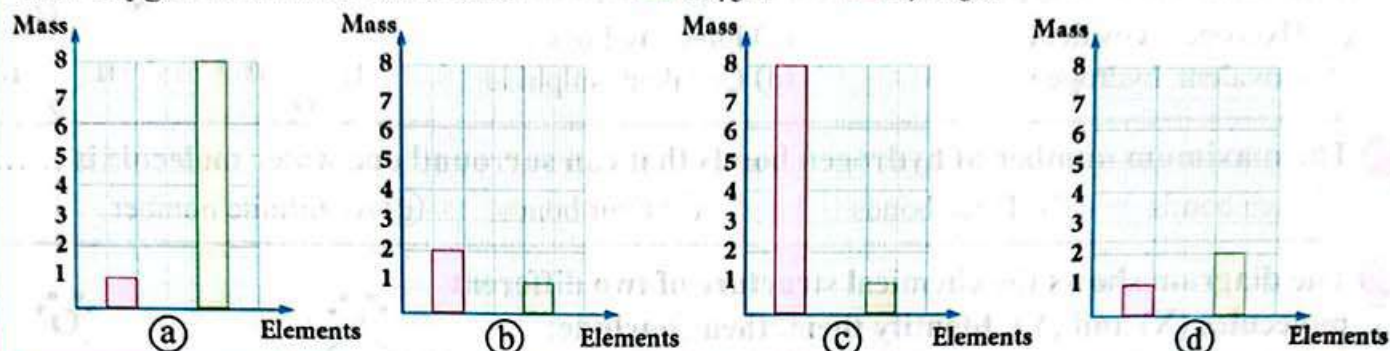
- 5 How many covalent bonds are present inside three water molecules?

- (a) 3 bonds      (b) 6 bonds  
 (c) 9 bonds      (d) 12 bonds



- 6 Which of the following graphs represents the relationship between the mass of hydrogen and oxygen in a water molecule?

■ Oxygen ■ Hydrogen



- 7 A pure sample of water contains 0.37 g of hydrogen. The total mass of the sample equals.....
- (a) 3.33 g (b) 2.96 g (c) 8.89 g (d) 1.1 g
- 8 A sample of water contains oxygen with a mass percentage of 90%. This sample is .....
- (a) Pure, with hydrogen mass percentage of 10%. (b) Impure, containing exogenous impurities  
(c) Impure, containing non-exogenous impurities (d) Pure, with hydrogen mass percentage of 11.11%

- 9 Which of the following structural diagrams correctly represents the water molecule and the bond angle between its two covalent bonds?



- 10 Which of the following expresses correctly the structure of the water molecule?



- 11 A covalent bond is a type of ..... bonds in which two atoms share a(an) ..... number of electrons. Which of the following is correct?

- (a) (1) Chemical, (2) equal (b) (1) Chemical, (2) unequal  
(c) (1) Physical, (2) equal (d) (1) Physical, (2) unequal

### The polarity of water

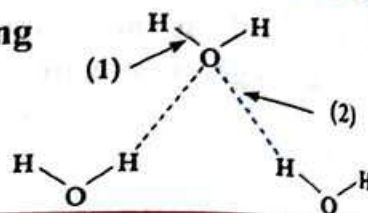
- 12 Which of the following correctly describes the components of a water molecule?

|     | Number of atoms | Number of covalent bonds | Number of hydrogen bonds |
|-----|-----------------|--------------------------|--------------------------|
| (a) | 3               | 2                        | 0                        |
| (b) | 3               | 1                        | 4                        |
| (c) | 2               | 2                        | 0                        |
| (d) | 2               | 1                        | 4                        |



- 13 From your study of the opposite diagram: Which of the following represents the two types of bonds (1) and (2), respectively?

(a) Hydrogen, covalent (b) Ionic, hydrogen  
(c) Covalent, hydrogen (d) Covalent, sulphide



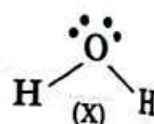
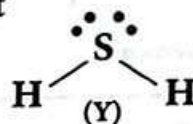
- 14 The maximum number of hydrogen bonds that can surround one water molecule is .....

(a) Two bonds (b) Three bonds (c) Four bonds (d) An infinite number

- 15 The diagram shows the chemical structure of two different molecules (X) and (Y). Identify them, then conclude:

Which of the two compounds has a higher boiling point?

(a) Compound (Y), due to hydrogen bonds between its molecules  
(b) Compound (X), due to covalent bonds  
(c) Compound (X), due to hydrogen bonds between its molecules  
(d) Compound (Y), due to covalent bonds



- 16 Which of the following explains the ability of water to dissolve most salts and break them into hydrated ions?

(a) Presence of ionic bonds (b) Presence of covalent bonds (c) Water polarity (d) Small bond angles

- 17 In polar molecules such as water, the more electronegative atom .....

(a) Has a lower ability to attract electrons (b) Carries one or more partial positive charges  
(c) Repels particles with positive charges (d) Carries one or more partial negative charges

- 18 A pure water sample contains ..... bonds.

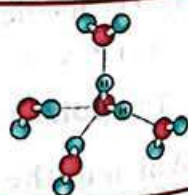
(a) Polar covalent bonds causing low boiling point. (b) Polar covalent bonds with bond angles  $> 90^\circ$   
(c) Hydrogen bonds causing low boiling point (d) Hydrogen bonds reducing cohesion

- 19 Which of the following explains why water has a higher boiling point compared to hydrogen sulphide ( $\text{H}_2\text{S}$ ), despite the similarity in their molecular structures?

(a) Oxygen is more electronegative than Sulphur  
(b) Covalent bonds in water are weaker than that in  $\text{H}_2\text{S}$   
(c) Water Hydrogen bonds are stronger than that in  $\text{H}_2\text{S}$ .  
(d) Water is non-polar while  $\text{H}_2\text{S}$  is polar

- 20 The diagram shows the structure of a water molecule. The angles between bonds in water molecule equals .....

(a)  $104.5^\circ$  (b)  $105.4^\circ$   
(c)  $120^\circ$  (d)  $100^\circ$

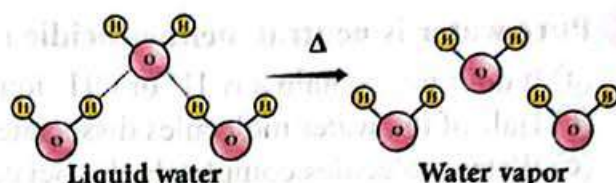


- 21 All the following are consequences of water polarity, except .....

(a) Water molecules associate together through hydrogen bonds  
(b) Ability to dissolve many mineral salts  
(c) Boiling point of water rises to  $100^\circ\text{C}$   
(d) Ability to dissolve a non-polar organic compound



- 22 The opposite diagram shows the process of converting a sample of liquid water into water vapor. What do you conclude from comparing the covalent bond with the hydrogen bond?



- (a) The covalent bond is stronger than the hydrogen bond; therefore, it is not broken during boiling.  
(b) The covalent bond is weaker than the hydrogen bond; therefore, it is broken during boiling.  
(c) The covalent bond is weaker than the hydrogen bond; therefore, it is not broken during boiling.  
(d) The covalent bond is stronger than the hydrogen bond; therefore, it is broken during boiling.

- 23 Which of the following statements explains the ability of water to dissolve ionic salts such as sodium chloride (NaCl)?

- (a) Water is a nonpolar molecule; therefore, it dissolves ionic salts easily.  
(b) Polar water molecules surround the ions and separate them from the crystal due to attraction of opposite charges.  
(c) Water contains strong covalent bonds that break the ionic bonds in salt.  
(d) Water is a polar molecule but cannot form bonds with ions.

- 24 Which of the following occurs in the dissolution of sodium chloride in water?

- (a) The crystal lattice breaks into sodium atoms and chlorine atoms.  
(b) Sodium ions are attracted to the positive pole of water.  
(c) Chloride ions are attracted to the negative pole of water.  
(d) Water molecules prevent sodium and chloride ions from recombining.

- 25 Read both statements carefully, then choose:

- (1): Sodium ions are surrounded by water molecules, water is attracted from the oxygen side.  
(2): Chloride ions are surrounded by water molecules, water is attracted from the oxygen side.  
During the dissolution of table salt in water, both sodium and chloride ions are surrounded by water molecules, and the result is .....

|     | Statement (1) | Statement (2) |
|-----|---------------|---------------|
| (a) | True          | True          |
| (b) | False         | True          |
| (c) | True          | False         |
| (d) | False         | False         |

- 26 Dissolution of sodium chloride in water is not considered hydrolysis because .....

- (a) Chloride ions combine with water to form hydrochloric acid.  
(b) Sodium ions combine with water to form sodium hydroxide.  
(c) Neither sodium nor chloride ions combine with water.  
(d) Both sodium and chloride ions combine with water.

### The ionic equilibrium of water and hydrolysis of salts

- 27 The equation representing the ionization of pure water is .....

- (a)  $\text{H}_2\text{O}_{(l)} \rightarrow \text{H}_2(\text{g}) + \text{O}_2(\text{g})$   
(b)  $\text{H}_2\text{O}_{(l)} \rightleftharpoons \text{H}^+_{(\text{aq})} + \text{OH}^-_{(\text{aq})}$   
(c)  $\text{H}_2\text{O}_{(l)} \rightarrow \text{H}^+_{(\text{aq})} + \text{OH}^-_{(\text{aq})}$   
(d)  $\text{H}_2\text{O}_{(l)} \rightleftharpoons \text{H}_3\text{O}^+_{(\text{aq})} + \text{O}^{2-}_{(\text{aq})}$



28 Pure water is neutral, neither acidic nor basic, because .....

- (a) It does not contain any  $H^+$  or  $OH^-$  ions.
- (b) Half of the water molecules dissociate into  $H^+$  and  $OH^-$  ions.
- (c) Water molecules completely dissociate into  $H^+$  and  $OH^-$  ions.
- (d) The concentration of  $H^+$  ions equals the concentration of  $OH^-$  ions.

29 All the following express hydrolysis, except .....

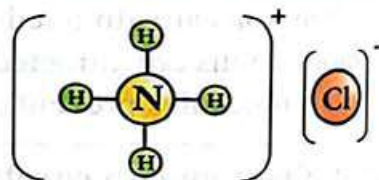
- (a) A salt dissolves in water producing a weak acid and a strong base.
- (b) A salt dissolves in water producing a strong acid and a weak base.
- (c) A salt dissolves in water producing a weak acid and a weak base.
- (d) A salt dissolves in water producing a strong acid and a strong base.

30 When salt (X) is dissolved in pure water, the concentration of hydrogen ions equals the concentration of hydroxide ions. Therefore, we conclude that .....

- (a) Salt solution X is neutral like ammonium chloride.
- (b) Salt solution X is acidic like ammonium chloride.
- (c) Salt solution X is neutral like sodium chloride.
- (d) Salt solution X is acidic like sodium chloride.

31 What is the type of solution resulting from dissolving the compound shown in the diagram in water?

- (a) Neutral
- (b) Acidic
- (c) Basic
- (d) Amphoteric



32 Which of the following salt solutions of equal concentration has the highest hydroxide ion concentration?

- (a) Table salt (NaCl)
- (b) Ammonium bicarbonate ( $NH_4HCO_3$ )
- (c) Ammonium chloride ( $NH_4Cl$ )
- (d) Sodium bicarbonate ( $NaHCO_3$ )

33 The hydrolysis of salt XY is represented by equation:  $XY_{(s)} + H_2O_{(l)} \rightarrow XOH_{(aq)} + H^+_{(aq)} + Y^-_{(aq)}$

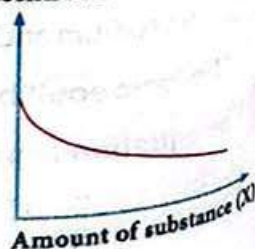
Based on this, which of the following represents the type of this solution?

- (a) Acidic; because the solution is rich in hydrogen ions
- (b) Basic; because the solution is rich in hydrogen ions
- (c) Neutral; because the solution is rich in hydroxide ions
- (d) Neutral; because the solution is rich in hydroxide ions

34 A substance (X) is added to pure water, leading to a change in the hydroxide ion concentration as shown in the diagram. Substance (X) may be .....

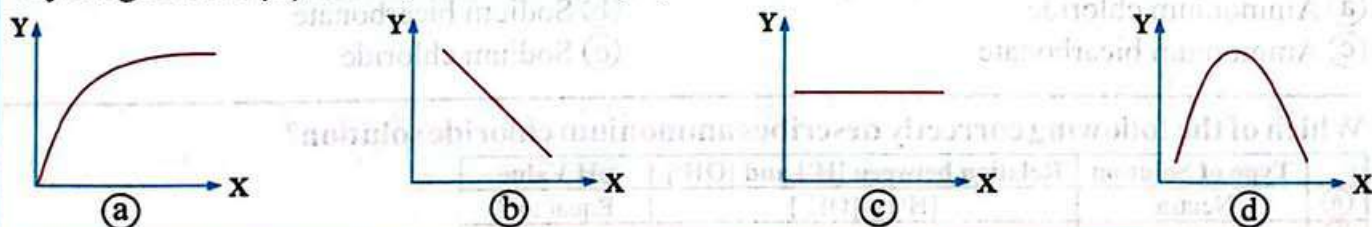
- (a) Sodium hydroxide (NaOH)
- (b) Sodium chloride (NaCl)
- (c) Ammonium chloride ( $NH_4Cl$ )
- (d) Sodium bicarbonate ( $NaHCO_3$ )

OH<sup>-</sup> Concentration



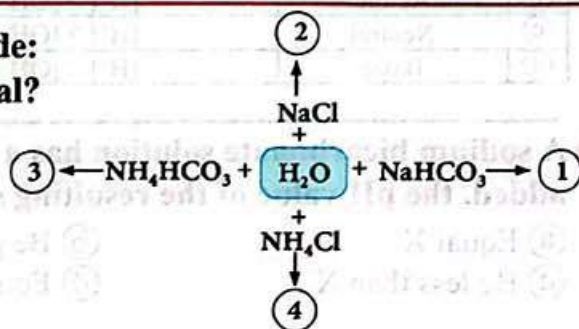


- 35** Which of the following dissolves in water without affecting the concentration of  $H^+$  or  $OH^-$  ions?
- (a) Acetic acid ( $CH_3COOH$ )                      (b) Sodium chloride ( $NaCl$ )  
(c) Ammonium chloride ( $NH_4Cl$ )                (d) Sodium bicarbonate ( $NaHCO_3$ )
- 36** All the following occur when ammonium chloride dissolves in water, except .....
- (a) Concentration of positive hydrogen ions increases  
(b) Concentration of negative hydroxide ions decreases  
(c) Hydrochloric acid molecules form  
(d) Ammonium hydroxide molecules form
- 37** Which of the following expresses the dissolution of ammonium bicarbonate in pure water?
- (a) Concentration of positive hydrogen ions increases  
(b) Concentration of negative hydroxide ions increases  
(c) The solution becomes neutral  
(d) Hydrolysis does not occur
- 38** The solution resulting from the dissolution of table salt in water is neutral because .....
- (a) Salt ions remain in the solution without bonding to water ions  
(b) All salt ions in the solution bond with water ions  
(c) Sodium ions in the solution bond with water ions  
(d) Chloride ions in the solution bond with water ions
- 39** Dissolution of a salt in water may lead to .....
- (a) Increase in both  $H^+$  and  $OH^-$  concentrations unequally  
(b) Decrease in both  $H^+$  and  $OH^-$  concentrations unequally  
(c) Some salt ions combine with water ions and the formation of an acidic solution  
(d) Not all salt ions combine with water ions and the formation of a basic solution
- 40** Which of the following graphs expresses the relation between the concentration of hydrogen ions (X) and hydroxide ions (Y) in the same solution?



- 41** Study the opposite chart carefully, then conclude:  
Which of the solutions shown in the chart is neutral?

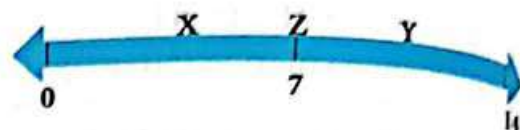
- (a) (1), (3)  
(b) (1), (2)  
(c) (3), (4)  
(d) (2), (3)





## The pH (hydrogen exponent)

The opposite diagram shows the pH values of three different aqueous solutions. Study it carefully, then conclude: Which of the following represents the type of aqueous solutions (X), (Y), (Z)?



|     | (X)     | (Y)     | (Z)     |
|-----|---------|---------|---------|
| (a) | Basic   | Acidic  | Neutral |
| (b) | Neutral | Basic   | Acidic  |
| (c) | Acidic  | Neutral | Basic   |
| (d) | Acidic  | Basic   | Neutral |

The pH value of distilled (pure) water at 25 °C equals ..... because .....

- (a) 4.5 - due to the presence of acidic impurities
- (b) 8.5 - due to the presence of basic impurities
- (c) 7 - because concentration of  $[H^+]$  equals that of  $[OH^-]$
- (d) 8 - because it is free of molecules

Which of the following statements correctly describes a sodium bicarbonate solution?

- (a) Its pH value equals 7
- (b) Its pH value is greater than 7
- (c) The concentration of hydrogen ions is greater than that of hydroxide ions
- (d) The concentration of hydrogen ions equals that of hydroxide ions

Which of the following salts, when dissolved in water, decreases the pH of water?

- (a) Ammonium chloride
- (b) Sodium bicarbonate
- (c) Sodium chloride
- (d) Ammonium bicarbonate

Which of the following salts, when dissolved in water, increases the pH?

- (a) Ammonium chloride
- (b) Sodium bicarbonate
- (c) Ammonium bicarbonate
- (d) Sodium chloride

Which of the following correctly describes ammonium chloride solution?

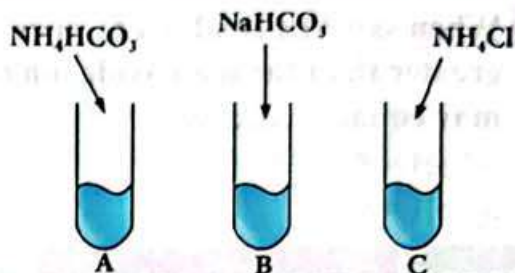
|     | Type of Solution | Relation between $[H^+]$ and $[OH^-]$ | pH Value       |
|-----|------------------|---------------------------------------|----------------|
| (a) | Neutral          | $[H^+] = [OH^-]$                      | Equal to 7     |
| (b) | Acidic           | $[H^+] > [OH^-]$                      | Less than 7    |
| (c) | Neutral          | $[H^+] > [OH^-]$                      | Equal to 7     |
| (d) | Basic            | $[H^+] < [OH^-]$                      | Greater than 7 |

A sodium bicarbonate solution has a pH value of X. When sodium chloride crystals are added, the pH value of the resulting solution will .....

- (a) Equal X
- (b) Be greater than X
- (c) Be less than X
- (d) Equal 7



- 49 Three test tubes contain water samples. After adding salts as shown in the figure, changes occur in the pH value. Which of the following is correct?



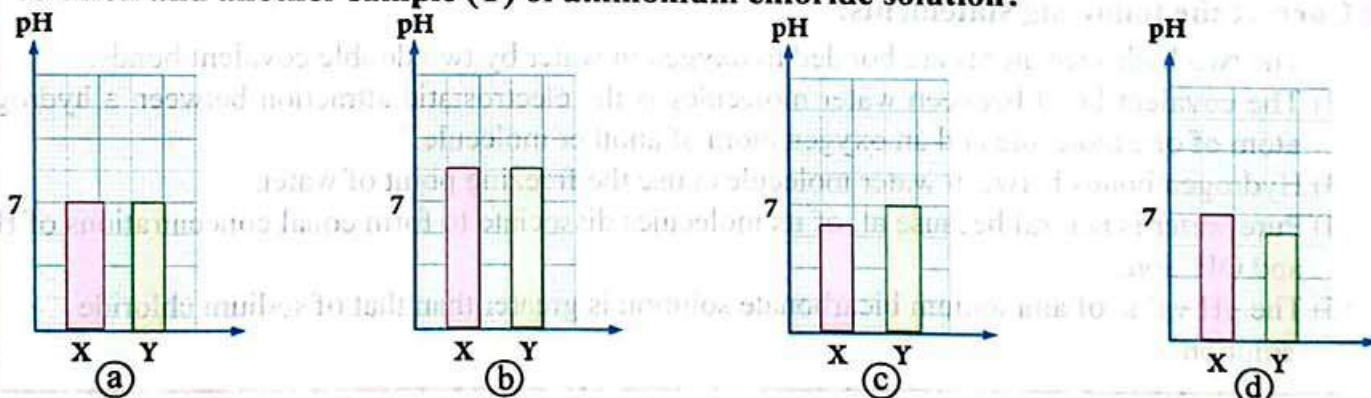
- 50 Two substances X and Y were each dissolved separately in pure water. The pH increased in the case of substance X, while the hydrogen ion concentration decreased in the case of substance Y. We conclude that .....

- (a) X and Y are both acidic substances (b) X and Y are both basic substances  
(c) X is acidic; Y is basic (d) X is basic; Y is acidic

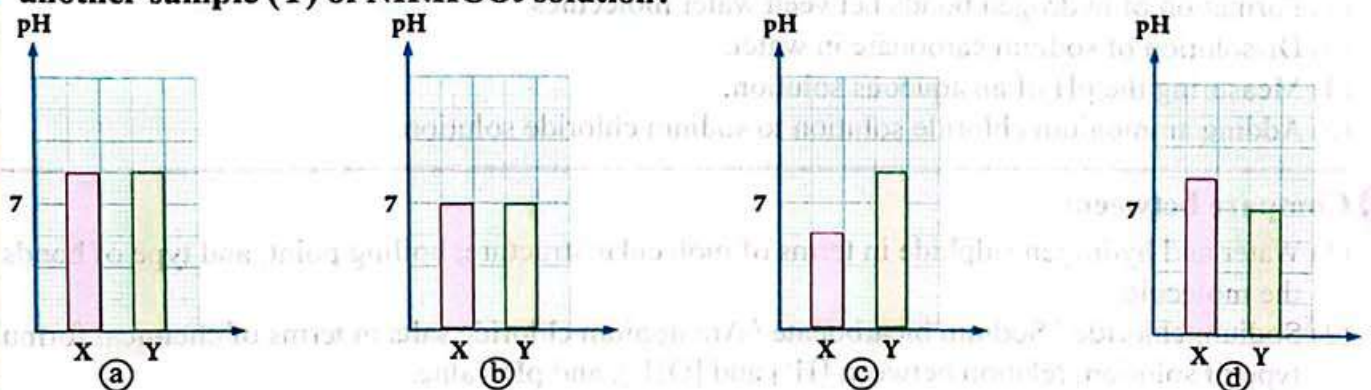
- 51 Which of the following correctly compares ammonium chloride and sodium bicarbonate solutions of equal concentration?

|     | Comparison Aspect                | Ammonium chloride solution | Sodium bicarbonate solution |
|-----|----------------------------------|----------------------------|-----------------------------|
| (a) | H <sup>+</sup> ion concentration | Lower                      | Higher                      |
| (b) | pH value                         | Lower                      | Higher                      |
| (c) | Type of solution                 | Acidic                     | Neutral                     |
| (d) | Type of solution                 | Neutral                    | Basic                       |

- 52 Which of the following graphs represents the pH of a sample (X) of sodium chloride solution and another sample (Y) of ammonium chloride solution?



- 53 Which of the following graphs represents the pH of a sample (X) of NaHCO<sub>3</sub> solution and another sample (Y) of NH<sub>4</sub>HCO<sub>3</sub> solution?





- 54 When salt MB is added to pure water, the hydrogen ion concentration becomes greater than the hydroxide ion concentration. The pH value of the resulting solution may equal .....

(a) pH = 5  
(c) pH = 9

(b) pH = 7  
(d) pH = 0

## Second Essay Questions

- 55 Write the scientific term

- (1) A type of chemical bond between two atoms formed by each atom sharing one or more electrons.
- (2) A measure of an atom's ability to attract bonding electrons toward itself.
- (3) A bond that links water molecules together and links them with other polar covalent molecules.
- (4) A solution in which the hydrogen ion concentration is less than the hydroxide ion concentration.
- (5) A scale ranging between 0 and 14.

- 56 Give reasons for the following:

- (1) Both bonds in the water molecule are covalent.
- (2) Water is a polar compound.
- (3) The pH value of pure water equals 7.
- (4) Sodium chloride solution has a neutral effect on chemical indicators.
- (5) The pH value of water may differ from 7.

- 57 Correct the following statements:

- (1) The two hydrogen atoms are bonded to oxygen in water by two double covalent bonds.
- (2) The covalent bond between water molecules is the electrostatic attraction between a hydrogen atom of one molecule and an oxygen atom of another molecule.
- (3) Hydrogen bonds between water molecules raise the freezing point of water.
- (4) Pure water is neutral because all of its molecules dissociate to form equal concentrations of  $H^+$  and  $OH^-$  ions.
- (5) The pH value of ammonium bicarbonate solution is greater than that of sodium chloride solution.

- 58 What happens when:

- (1) Oxygen is more electronegative than hydrogen in the water molecule.
- (2) Formation of hydrogen bonds between water molecules.
- (3) Dissolution of sodium carbonate in water.
- (4) Measuring the pH of an aqueous solution.
- (5) Adding ammonium chloride solution to sodium chloride solution.

- 59 Compare between:

- (1) Water and hydrogen sulphide in terms of molecular structure, boiling point, and type of bonds in the molecule.
- (2) Sodium chloride / Sodium bicarbonate / Ammonium chloride salts in terms of chemical formula, type of solution, relation between  $[H^+]$  and  $[OH^-]$ , and pH value.



**60** A pure water sample has a mass of 0.9 g. Calculate the mass of hydrogen and oxygen in this sample. (Given that atomic masses: H = 1, O = 16)

**61** Water is a polar solvent that can dissolve most salts and polar compounds. Explain why water is polar.

**62** Based on your study: Which tools can be used to measure pH? Which is the most accurate?

**63** The following table shows the pH of different salt solutions:

| Salt solution | pH value |
|---------------|----------|
| (A)           | 5.5      |
| (B)           | 7.0      |
| (C)           | 8.9      |

(1) Which of these salt solutions contains the highest concentration of hydrogen ions?

(2) Which of them has equal concentrations of hydrogen and hydroxide ions?

**64** If you are given three bottles:

| Bottle Number | Bottle Contents                                          |
|---------------|----------------------------------------------------------|
| (1)           | Contains pure water with added ammonium chloride powder  |
| (2)           | Contains pure water with added sodium bicarbonate powder |
| (3)           | Contains pure water with no additions                    |

Based on your study, how can you distinguish between them?





Questions marked with are answered with explanations

## First Multiple Choice Questions

### Density and Relative Density

1 The measuring unit of relative density is .....

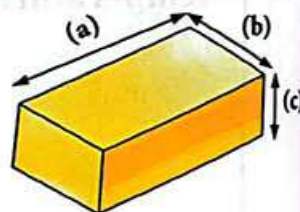
- (a)  $\text{g/cm}^3$  (b)  $\text{kg/cm}^3$  (c)  $\text{g/cm}^2$  (d) It has no unit

2 A student wanted to measure the density of a liquid by determining its mass and volume. The instruments used in the measurement are .....

|     | Instrument for measuring mass | Instrument for measuring volume |
|-----|-------------------------------|---------------------------------|
| (a) | Spring balance                | Wooden ruler                    |
| (b) | Digital balance               | Graduated cylinder              |
| (c) | Spring balance                | Conical flask                   |
| (d) | Digital balance               | Glass beaker                    |

3 The opposite figure shows the dimensions of a solid metallic object in the form of cuboid with mass ( $m$ ). From the data of the figure, the density of the material of the object can be calculated from the relation .....

- (a)  $m \times a \times b$  (b)  $m \times a \times b \times c$   
 (c)  $\frac{m}{b \times c}$  (d)  $\frac{m}{a \times b \times c}$



4 The candle floats on the surface of water, while it sinks in alcohol. This is explained by .....

- (a) The candle has a greater mass in alcohol  
 (b) The mass of water is less than the mass of alcohol  
 (c) The density of water is greater than the density of alcohol  
 (d) All of the above are possible

5 The two physical quantities that must be measured for a body in order to know whether it floats or sinks when placed in water of density ( $1 \text{ g/cm}^3$ ) are .....

- (a) Mass and volume (b) Volume and area (c) Mass and area (d) Weight and area

6 The opposite table shows the masses and volumes of four different substances (A), (B), (C), and (D) at the same temperature. The substance with the lowest density is .....

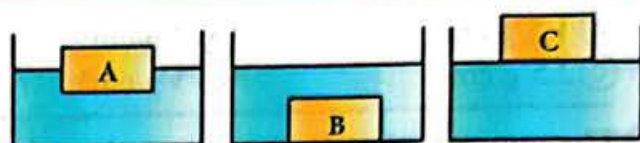
- (a) (A) (b) (B)  
 (c) (C) (d) (D)

| Substance | Volume ( $\text{cm}^3$ ) | Mass (g) |
|-----------|--------------------------|----------|
| (A)       | 2.0                      | 5.4      |
| (B)       | 3.0                      | 13       |
| (C)       | 6.0                      | 15       |
| (D)       | 5.0                      | 18       |



- 7 One kilogram of iron is equal to one kilogram of sugar in .....  
(a) Volume only (b) Mass only (c) Density only (d) Density and volume

- 8 The opposite figure shows three objects (A), (B), and (C) placed in the same liquid, as shown in the figure. The relation between the densities of the three objects is .....



- (a)  $\rho_A = \rho_C > \rho_B$  (b)  $\rho_A > \rho_C > \rho_B$  (c)  $\rho_B > \rho_A > \rho_C$  (d)  $\rho_B > \rho_C > \rho_A$

- 9 If the density of gold at  $4^\circ\text{C}$  equals  $19300 \text{ kg/m}^3$ , then the relative density of gold at the same temperature is ..... (Given that the density of water is  $1000 \text{ kg/m}^3$ )

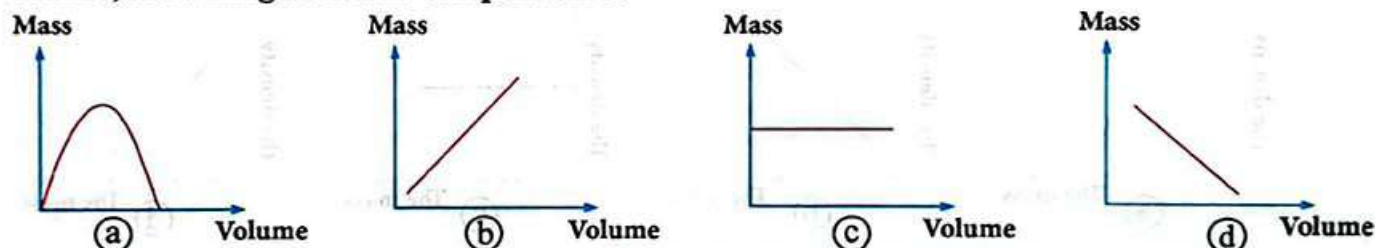
- (a) 19.3 (b) 1.93 (c) 193 (d) 0.193

- 10 The opposite figure shows the melting of an ice cube with a volume of  $100 \text{ cm}^3$  and a density of  $0.9 \text{ g/cm}^3$  into liquid water with a density of  $1 \text{ g/cm}^3$ . The volume of water resulting from the complete melting of the ice is .....



- (a)  $75 \text{ cm}^3$  (b)  $80 \text{ cm}^3$  (c)  $90 \text{ cm}^3$  (d)  $100 \text{ cm}^3$

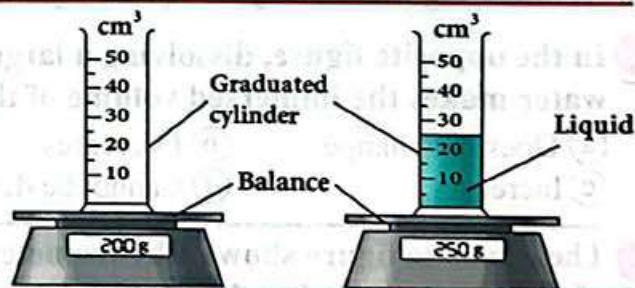
- 11 Which of the following graphs represents the relation between the mass of a liquid and its volume, assuming constant temperature?



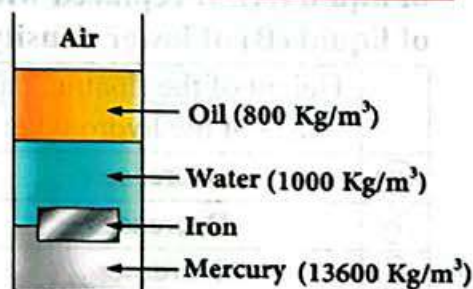
- 12 The opposite figure shows an experiment to determine the density of a liquid by measuring its volume and mass.

The density of this liquid equals .....

- (a)  $0.5 \text{ g/cm}^3$  (b)  $2 \text{ g/cm}^3$   
(c)  $8 \text{ g/cm}^3$  (d)  $10 \text{ g/cm}^3$



- 13 The opposite figure shows several immiscible liquids of known density settled inside a container. When a piece of iron was dropped into the container, it suspended as shown in the figure. The density of iron can be ..... ( $\text{kg/m}^3$ )

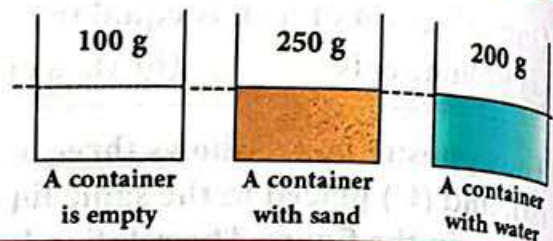


- (a) 600 (b) 1000  
(c) 8000 (d) 14000



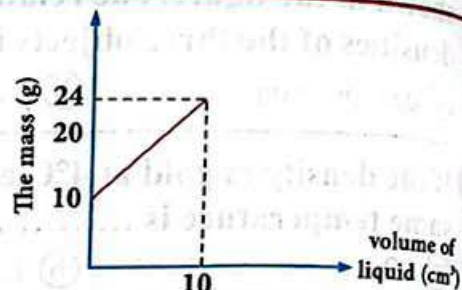
- 14 From the opposite figures, knowing water density =  $1 \text{ g/cm}^3$ , the density of sand equals .....

(a)  $1.5 \text{ g/cm}^3$  (b)  $2 \text{ g/cm}^3$   
 (c)  $2.5 \text{ g/cm}^3$  (d)  $3 \text{ g/cm}^3$



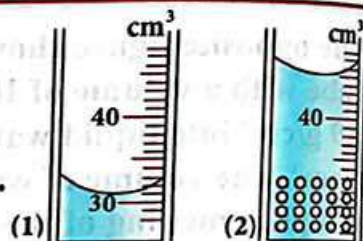
- 15 The opposite graph represents the relation between the mass of a container filled with a liquid and the volume of the added liquid at the same temperature. The density of the liquid equals .....

(a)  $0.6 \text{ g/cm}^3$  (b)  $0.8 \text{ g/cm}^3$   
 (c)  $1.4 \text{ g/cm}^3$  (d)  $1.8 \text{ g/cm}^3$

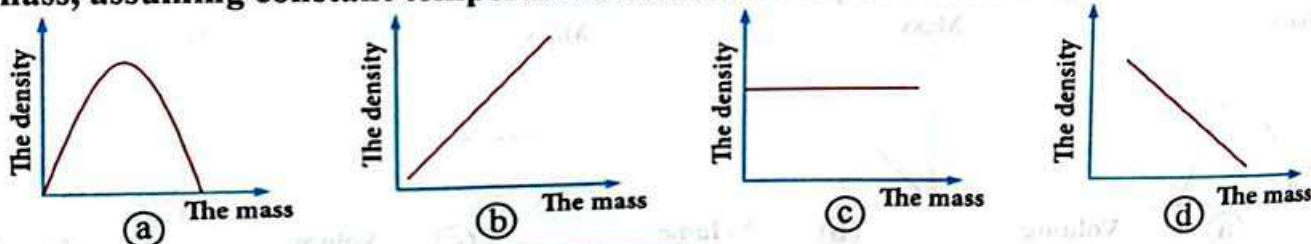


- 16 Figures (1) and (2) show an experiment to determine the mass of a small iron sphere. Figure (1) has a graduated cylinder with water, while Figure (2) shows it after adding (20) identical spheres. The mass of one sphere equals ..... (Density of iron =  $7.5 \text{ g/cm}^3$ )

(a) 1.87 g (b) 2.75 g (c) 5.25 g (d) 16.9 g



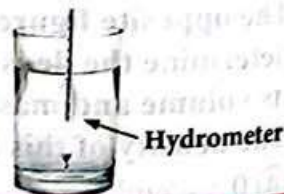
- 17 Which of the following figures represents the relation between the density of a liquid and its mass, assuming constant temperature .....



### Measuring the density of liquids (Hydrometer)

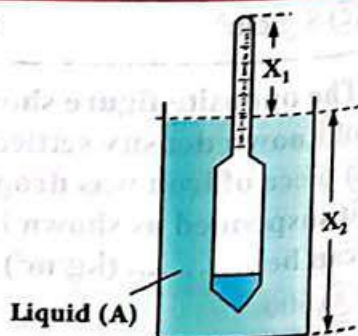
- 18 In the opposite figure, dissolving a large amount of salt in pure water makes the immersed volume of the hydrometer .....

(a) Does not change (b) Decreases  
 (c) Increases (d) Cannot be determined



- 19 The opposite figure shows a hydrometer measuring the density of liquid (A). If replaced with the same amount of liquid (B) of lower density, then .....

|     | Height of the floating part ( $X_1$ ) of the hydrometer | Height of liquid B in the container ( $X_2$ ) |
|-----|---------------------------------------------------------|-----------------------------------------------|
| (a) | Decreases                                               | Decreases                                     |
| (b) | Decreases                                               | Increases                                     |
| (c) | Increases                                               | Decreases                                     |
| (d) | Increases                                               | Increases                                     |





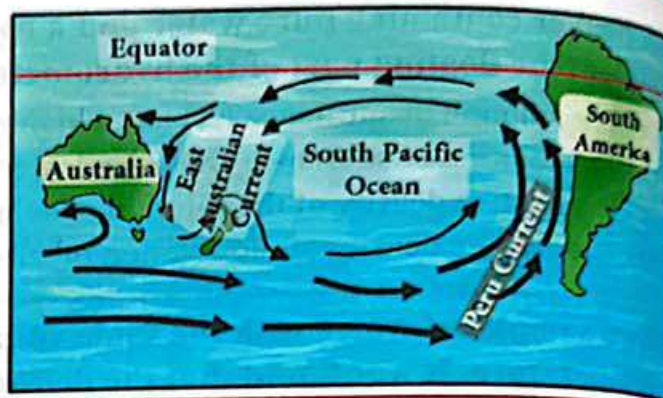
- 20** A beaker containing pure water and a hydrometer was used. When substance (X) is added, the floating part of the hydrometer increases. This means that .....
- The solution of substance (X) has a higher density than pure water
  - The solution of substance (X) has a lower density than pure water
  - The relative density of the solution of substance (X) is less than one
  - The relative density of the solution of substance (X) equals one
- 
- 21** Two samples of water with the same volume were tested using the hydrometer at the same temperature. It was found that the density of one sample is greater than the other. Therefore, both samples .....
- Are considered pure water
  - Have the same mass
  - Have the same degree of purity
  - Have different degrees of purity
- 
- 22** When measuring the densities of two liquids (A) and (B) using the hydrometer, the readings were 0.91 and 0.94 respectively. Which of the following is correct about liquids (A) and (B)? (Given that the two liquids do not mix)
- When mixed, liquid A floats on liquid B
  - When mixed, liquid B floats on liquid A
  - The floating part of the hydrometer in case (A) is larger
  - The floating part of the hydrometer in both cases is equal
- 
- 23** In shallow waters, the density of water hardly changes with increasing depth because of .....
- Increase of dissolved salts
  - Decrease in temperature
  - Its incompressibility
  - Vertical water currents
- 
- 24** At great depths, water pressure increases, leading to .....
- Separation of water molecules
  - Compression of water molecules
  - Increase in water density
  - Both (b) and (c)
- 
- 25** Nutrients in oceans are transported from the deep ocean to the surface by .....
- Waves
  - Tides
  - Water currents
  - Both (a) and (c)
- 
- 26** Differences in ocean water density are one of the causes of .....
- Ocean pollution
  - Ocean currents
  - Formation of icebergs
  - Few nutrients
- 
- 27** By increasing salinity of water, the density of water .....
- Decreases
  - Increases
  - Does not change
  - Changes randomly
- 
- 28** Ocean currents contribute to .....
- Transferring heat and salts from tropical regions to polar regions
  - Transferring nutrients from the deep ocean to the surface
  - Transferring freshwater flowing from glaciers to different places
- (I) and (II) only
  - (I) and (III) only
  - (II) and (III) only
  - (I), (II), and (III)



- 29 The opposite figure shows the Peru Current and the East Australian Current.

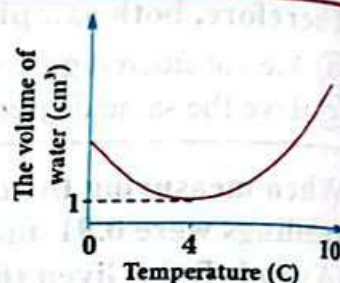
They are classified as .....

- (a) Both are cold currents  
(b) Only the Peru Current is warm  
(c) Both are warm currents  
(d) Only the Peru Current is cold

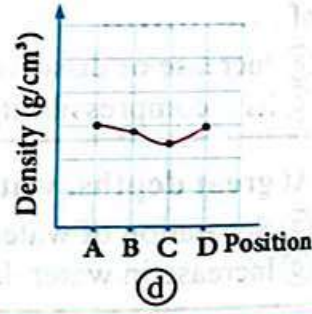
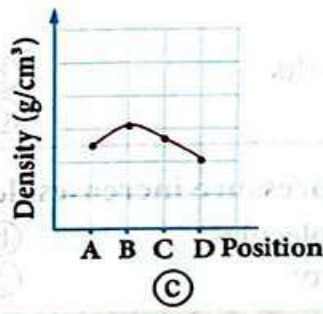
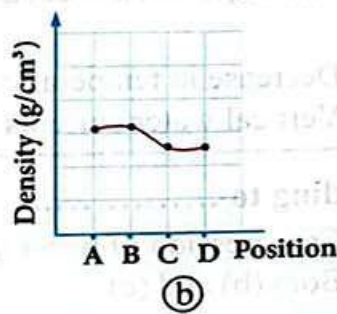
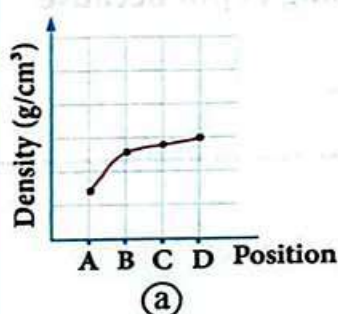
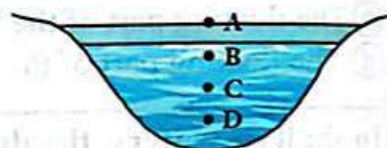


- 30 Study the opposite graph, then state in which temperature range pure water behaves differently from most liquids?

- (a) From  $0^{\circ}\text{C}$  to  $4^{\circ}\text{C}$ , mass constant, density increases  
(b) From  $0^{\circ}\text{C}$  to  $4^{\circ}\text{C}$ , density constant, mass increases  
(c) From  $4^{\circ}\text{C}$  to  $10^{\circ}\text{C}$ , mass constant, density decreases  
(d) From  $4^{\circ}\text{C}$  to  $10^{\circ}\text{C}$ , density constant, mass decreases

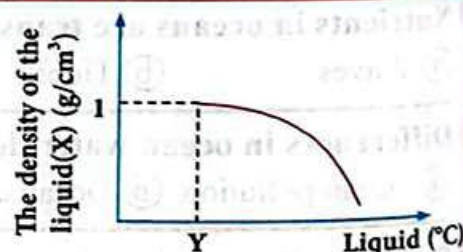


- 31 You are given a picture of a lake where a drop in temperature formed a surface ice layer. Which graph correctly shows the density of water at positions (A, B, C, D)?



- 32 Study the opposite graph: Which of the following correctly represents liquid (X) and temperature (Y)?

|     | Liquid (X)   | Temperature (Y)     |
|-----|--------------|---------------------|
| (a) | Pure water   | $3^{\circ}\text{C}$ |
| (b) | Pure water   | $4^{\circ}\text{C}$ |
| (c) | Impure water | $3^{\circ}\text{C}$ |
| (d) | Impure water | $4^{\circ}\text{C}$ |

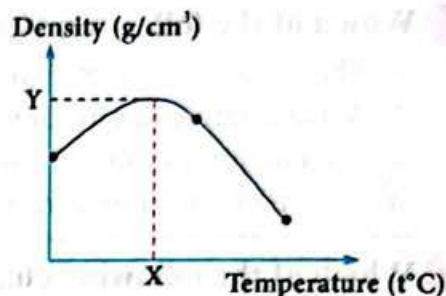


- 33 If the temperature of water gradually increases from  $0^{\circ}\text{C}$  to  $20^{\circ}\text{C}$ , then the density of water .....

- (a) Decreases  
(b) Increases  
(c) Is not affected  
(d) Increases until it reaches its maximum value, then decreases



- 34 The opposite figure represents the relation between the density of pure water and temperature. The values of both X and Y on the figure are .....



|     | The value (X) | The value (Y)       |
|-----|---------------|---------------------|
| (a) | 2°C           | 4 g/cm <sup>3</sup> |
| (b) | 4°C           | 1 g/cm <sup>3</sup> |
| (c) | 0°C           | 1 g/cm <sup>3</sup> |
| (d) | 5°C           | 4 g/cm <sup>3</sup> |

- 35 Why does ice become less dense than water?
- Because water molecules get closer in ice
  - Because ice molecules are more spread out than water molecules
  - Because ice contains air bubbles
  - Because ice melts quickly
- 36 The density of ocean water changes according to which of the following factors?
- Its temperature
  - Salinity
  - Water pressure
  - All of the above
- 37 What mainly causes water molecules to be more spread out in ice than in liquid water?
- High temperature
  - Low pressure
  - Type of Hydrogen bonds forming a crystal structure
  - Presence of impurities in water
- 38 What is the relation between the volume of water and its density when its temperature rises above 4°C?
- Volume increases and density decreases
  - Volume decreases and density increases
  - Volume increases and density increases
  - Volume decreases and density decreases
- 39 The relation between the temperature of pure water and its volume (when its temperature increases from 0°C to 4°C) is a ..... relation
- Inverse
  - Direct
  - Irregular
  - No relation
- 40 A layer of ice forms in lakes in polar regions at .....
- The bottom of the lake, providing a habitat for polar animals
  - The bottom of the lake, and the water temperature rises at the surface
  - The surface of the lake, acting as an insulator for the rest of the water
  - The surface of the lake because ice is denser than water
- 41 The internal energy of a body depends on .....
- The energy resulting from the motion of the molecules
  - The energy resulting from the positions of the molecules relative to each other
  - The energy required to heat the substance
- (I) and (II) only
  - (I) and (III) only
  - (II) and (III) only
  - (I), (II), and (III)



42 Which of the following expresses the concept of temperature?

- (a) The energy transferred to, from, or through a body
- (b) A quantitative description of how hot or cold a body
- (c) The energy resulting from the motion of the molecules of the substance
- (d) The energy resulting from the positions of the molecules

43 Which of the following changes occur when a body or system is cooled?

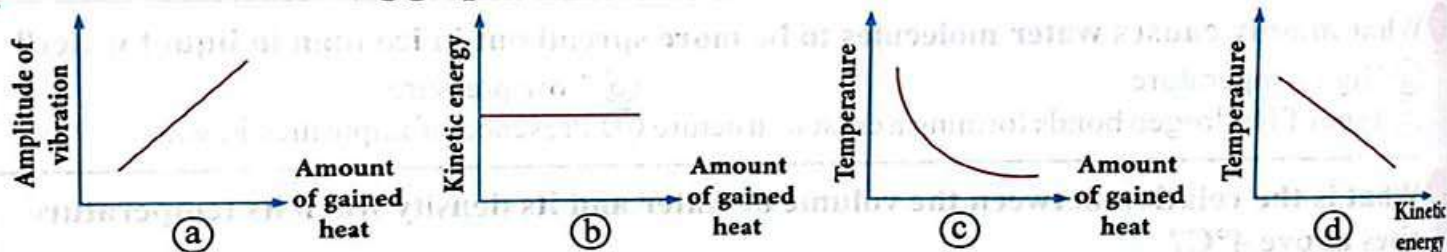
- (I) The amplitude of vibration of the molecules in the substance or system decreases
- (II) The potential energy of the molecules decreases and their speed increases
- (III) The internal energy of the body or system decreases

- (a) (I) and (II) only
- (b) (I) and (III) only
- (c) (II) and (III) only
- (d) (I), (II), and (III)

44 An increase in the temperature of a body by one-degree Celsius means .....

- (a) A decrease in the average kinetic energy of the body's molecules
- (b) An increase in the body's temperature by 274 Kelvin
- (c) An increase in the body's temperature by one Kelvin
- (d) A decrease in the body's internal energy

45 Which of the following graphs is correct?



46 If the temperature of a body equals  $30^{\circ}\text{C}$ , then on the Kelvin scale it equals .....

- (a) 273 K
- (b) 8190 K
- (c) 303 K
- (d) 243 K

47 Body (A) is in contact with body (B) which has a higher temperature. Heat energy transfers from ..... and stops when .....

- (a) A to B / A becomes hotter than B
- (b) A to B / A and B become equal
- (c) B to A / A becomes hotter than B
- (d) B to A / A and B become equal

48 A body has a temperature of 220 K which changed to  $3^{\circ}\text{C}$ . The average kinetic energy of the body's molecules .....

- (a) Increases
- (b) Decreases
- (c) Does not change
- (d) No correct answer

49 The specific heat of a substance changes when ..... of the substance changes.

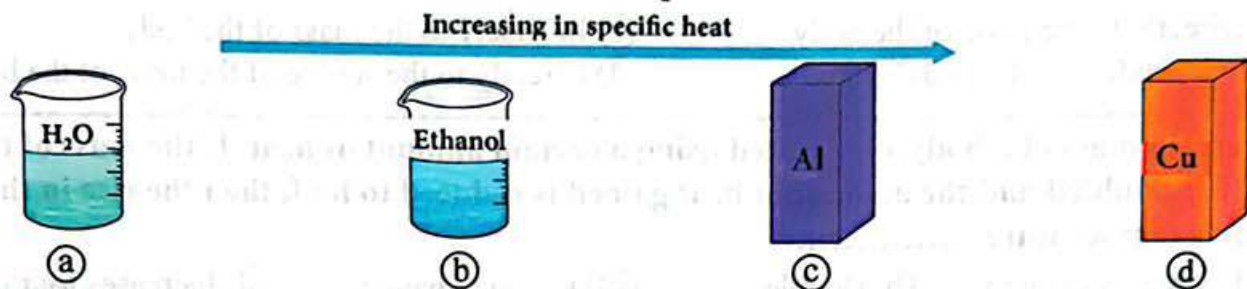
- (a) The physical state
- (b) The mass
- (c) The temperature
- (d) The volume

50 If the temperature of a body is doubled, its specific heat .....

- (a) Decreases to one third
- (b) Increases to three times
- (c) Increases to double
- (d) Remains constant



- 51 Which of the following substances requires a certain mass of it less energy to change its temperature by the same amount in the same period of time?



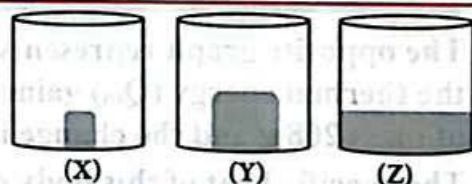
- 52 The following table shows the specific heat capacities of four different substances. When heating 70 g of each substance under the same conditions; Which of them will heat up first?

| Substance              | (A) | (B) | (C) | (D) |
|------------------------|-----|-----|-----|-----|
| Specific heat (J/Kg.K) | 385 | 130 | 710 | 450 |

- (a) A (b) B (c) C (d) D
- 53 If the specific heat of aluminum is 897 J/kg.K and the specific heat of copper is 385 J/kg.K, and equal masses of aluminum and copper are exposed to the same amount of heat for the same period of time, which of the following changes is expected to occur?
- (a) The final temperature of aluminum = The final temperature of copper  
(b) The final temperature of aluminum is higher than the final temperature of copper  
(c) The final temperature of aluminum is lower than the final temperature of copper  
(d) The temperature of aluminum increases while the temperature of copper decreases

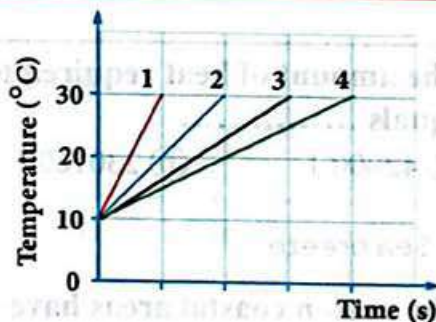
- 54 The opposite figure shows three samples of aluminum:

(X): a 5 g solid piece (Y): a 10 g solid piece  
(Z): a 10 g molten piece,



Which of the previous samples have the same specific heat?

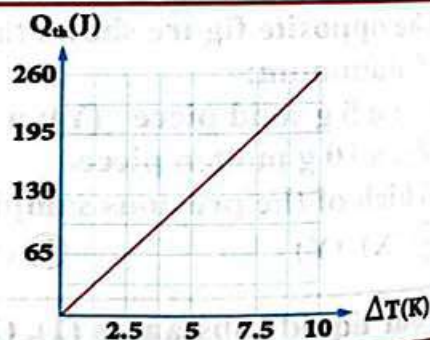
- (a) (X), (Y) (b) (Y), (Z) (c) (X), (Z) (d) (X), (Y), (Z)
- 55 Four liquid substances (1), (2), (3), and (4) have the same mass and the same initial temperature. They were placed in identical containers and heated under the same conditions. The opposite graph shows their temperature change over time. Which liquid has the lowest specific heat?



- 56 The factors on which the amount of heat lost or gained by a substance depends when its temperature changes are .....
- (a) The mass and density of the substance (b) The specific heat of the substance only  
(c) The mass of the substance and its specific heat (d) The mass of the substance only



- 57 When a body gains a certain amount of heat, the change in its temperature is proportional .....
- (a) Directly to the mass of the body (b) Inversely to the mass of the body  
(c) Independent of the body's mass (d) Directly to the square of the mass of the body
- 58 A certain mass of a body was heated using a certain amount of heat. If the mass of the body is doubled and the amount of heat gained is reduced to half, then the rise in the body's temperature .....
- (a) Decreases to quarter (b) Doubles (c) Does not change (d) Increases four times
- 59 How much thermal energy does water lose when its temperature decreases by  $(8^\circ\text{C})$ , given that the mass of water is  $(200\text{ g})$  and its specific heat is approximately  $(4200\text{ J/kg}\cdot\text{K})$ ?
- (a)  $6720\text{ J}$  (b)  $67200\text{ J}$  (c)  $672000\text{ J}$  (d)  $6720000\text{ J}$
- 60 A piece of metal with a mass of  $(100\text{ g})$  gained  $(2340\text{ J})$  of heat, raising its temperature from  $(20^\circ\text{C})$  to  $(80^\circ\text{C})$ . The specific heat of this metal is .....
- (a)  $(0.39\text{ J/Kg}\cdot\text{K})$  (b)  $(39\text{ J/Kg}\cdot\text{K})$  (c)  $(390\text{ J/Kg}\cdot\text{K})$  (d)  $(3.9\text{ J/Kg}\cdot\text{K})$
- 61 When mixing  $100\text{ g}$  of water at a temperature of  $53^\circ\text{C}$  with  $200\text{ g}$  of water at a temperature of  $23^\circ\text{C}$ , the temperature of the mixture becomes equal to ..... (assuming no energy loss)
- (a)  $33\text{ K}$  (b)  $303\text{ K}$  (c)  $33^\circ\text{C}$  (d)  $38^\circ\text{C}$
- 62 The opposite graph represents the relation between the thermal energy ( $Q_{th}$ ) gained by a metallic body of mass  $208\text{ g}$  and the change in its temperature ( $\Delta T$ ). The specific heat of this body equals .....
- (a)  $120\text{ J/Kg}\cdot\text{K}$  (b)  $130\text{ J/Kg}\cdot\text{K}$   
(c)  $125\text{ J/Kg}\cdot\text{K}$  (d)  $135\text{ J/Kg}\cdot\text{K}$
- 63 The amount of heat required to raise the temperature of  $1\text{ kg}$  of glass from  $30^\circ\text{C}$  to  $304^\circ\text{C}$  equals ..... (Given that the specific heat of glass =  $840\text{ J/kg}\cdot\text{K}$ )
- (a)  $42000\text{ J}$  (b)  $230160\text{ J}$  (c)  $840\text{ J}$  (d)  $71400\text{ J}$



### Sea breeze

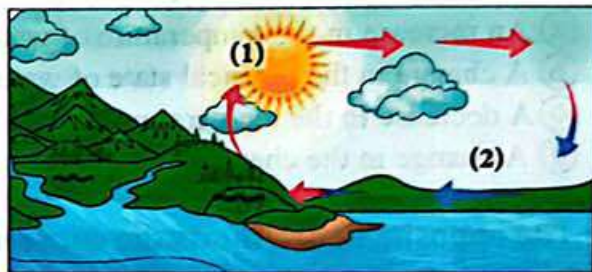
- 64 The reason coastal areas have a moderate climate compared to inland areas is .....
- (a) Low evaporation in water (b) The high specific heat of water  
(c) The low relative density of water (d) The increased salinity of seawater
- 65 The high specific heat of water makes the waters of oceans and seas .....
- (a) Gain and lose heat quickly (b) Unaffected by the sun's temperature  
(c) Gain and lose heat slowly (d) Always maintain a constant temperature



- 66 Which of the following expresses the movement of cool air (breeze) during the day and night in coastal areas?

|     | Movement of cool air during the day | Movement of cool air at night |
|-----|-------------------------------------|-------------------------------|
| (a) | From sea to land                    | From sea to land              |
| (b) | From sea to land                    | From land to sea              |
| (c) | From land to sea                    | From land to sea              |
| (d) | From land to sea                    | From sea to land              |

- 67 The opposite figure represents one of the phenomena resulting from the high specific heat of water. Which of the following is correct about the opposite figure?



- (a) (1): Cold air with higher density  
(b) (2): Hot air with lower density  
(c) The air in direction (1) is called sea breeze  
(d) The air in direction (2) is called sea breeze

- 68 When comparing coral reefs with cold-blooded marine organisms, we find that .....

|     | Coral reefs                               | Cold-blooded marine organisms                                                    |
|-----|-------------------------------------------|----------------------------------------------------------------------------------|
| (a) | Withstand temperature changes             | Do not withstand temperature changes                                             |
| (b) | Live in cold surface waters               | Live in the depths of seas and oceans                                            |
| (c) | Do not withstand temperature changes      | Withstand temperature changes                                                    |
| (d) | Need a specific temperature to stay alive | Their body temperature depends on the temperature of the surrounding environment |

- 69 The latent heat of vaporization is defined as .....

- (a) The thermal energy required to raise the temperature of 1 kg of a substance  
(b) The thermal energy absorbed by a unit mass of the substance  
(c) The thermal energy released from the substance when it freezes  
(d) The thermal energy required only to break hydrogen bonds

- 70 Why does water have a high latent heat of vaporization?

- (a) Because of the small size of its molecules  
(b) Because of the presence of hydrogen bonds between its molecules  
(c) Because of its low boiling point  
(d) Because of its inability to transfer heat

- 71 Living organisms benefit from the evaporation of water from their bodies because evaporation works on .....

- (a) Increasing their weight  
(b) Regulating their body temperature  
(c) Supplying their bodies with energy  
(d) Increasing the rate of biochemical reactions

- 72 During sweating in humans or animals, the evaporated water molecules help regulate body temperature by .....

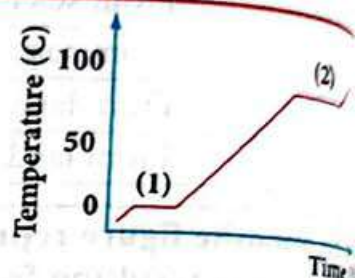
- (a) Increasing body temperature  
(b) Causing the body to lose heat  
(c) Increasing body moisture  
(d) Increasing blood pressure



73 During the change from liquid to gas (vapor) state by latent heat of vaporization, what happens to the substance's temperature?

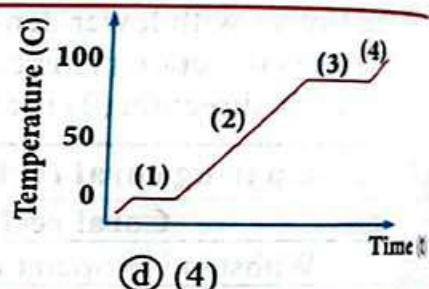
- (a) Increases (b) Decreases (c) Does not change (d) Vibrates

74 The opposite figure shows the curve of the change in water temperature over time when it is gradually heated from the solid state (ice) to the gaseous state (vapor), showing the change in physical state. What do the two horizontal parts (1) and (2) of the curve represent?



- (a) An increase in the temperature of water  
 (b) A change in the physical state of water while the temperature remains constant  
 (c) A decrease in the temperature of water  
 (d) A change in the chemical composition of water

75 The opposite figure shows the curve of the change in water temperature over time when it is heated from the solid state to the gaseous state. Which of the parts (1), (2), (3), (4) of the curve represent the latent heat of vaporization?

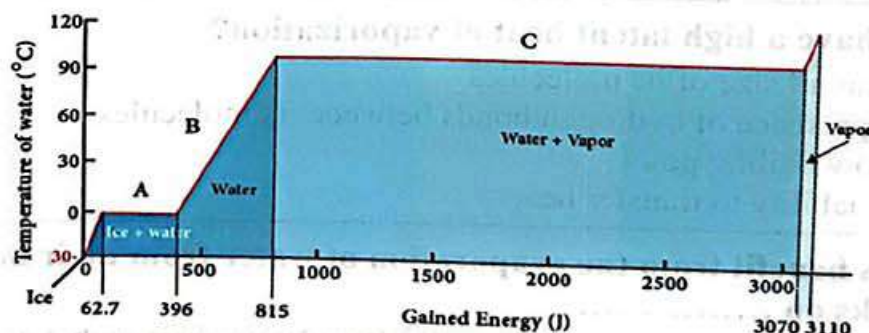


- (a) (1) (b) (2) (c) (3) (d) (4)

76 Why does the evaporation of water require much more energy than heating it from  $0^{\circ}\text{C}$  to  $100^{\circ}\text{C}$  for the same mass?

- (a) Because water has a high specific heat capacity  
 (b) Because evaporation requires breaking the hydrogen bonds between water molecules  
 (c) Because the boiling point of water is very high  
 (d) Because the latent heat of vaporization is less than the heat required for heating

77 The following graph shows the relation between the absorbed thermal energy and the temperature of water, illustrating latent heat of vaporization.



What is the essential difference between the energy absorbed in region (B) and region (C)?

- (a) In (B) the state of matter changes, while in (C) it does not  
 (b) In (B) the temperature does not change, while in (C) it changes  
 (c) In (B) the temperature changes and the state of matter does not, while in (C) the state of matter changes and the temperature does not  
 (d) There is no essential difference



- 78** For living organisms to stay alive, this requires .....
- (a) A wide range of temperatures (b) A specific range of temperatures  
(c) Any temperature (d) Very low temperatures
- 
- 79** Sharp changes in temperature are especially fatal for organisms that are .....
- (a) Large in size (b) Very small  
(c) Warm-blooded (d) Living in the depths of the oceans
- 
- 80** What may result from temperature changes due to climate change for coral reefs?
- (a) Their growth (b) Their reproduction (c) Their death (d) Their spread
- 
- 81** Why are oceans and lakes considered massive heat reservoirs?
- (a) Because of the low specific heat of water (b) Because of the high specific heat of water  
(c) Because of their large size only (d) Because of their ocean currents
- 
- 82** What helps maintain stable temperatures in the surrounding marine environment?
- (a) Absorption of solar energy by water at night (b) Slow release of solar energy by water at night  
(c) Lack of absorption of solar energy by water (d) Significant rise in water temperature
- 
- 83** What property that helps protecting marine organisms from rapid changes in temperature?
- (a) Low specific heat of water (b) High specific heat of water  
(c) Rapid evaporation of water (d) Low salinity of water
- 
- 84** Cold-blooded organisms (Poikilotherms) are organisms that .....
- (a) Keep their body temperature constant  
(b) Depend on the surrounding environment for their body temperature  
(c) Live only in warm environments  
(d) Live only in cold environments
- 
- 85** Cold-blooded marine organisms are most often found .....
- (a) In warm surface waters (b) In the depths of seas and oceans  
(c) In polar regions (d) On land
- 
- 86** Examples of cold-blooded organisms include .....
- (a) Birds and mammals  
(b) Most vertebrates such as fish, amphibians, and reptiles  
(c) All marine organisms  
(d) Organisms that live on land
- 
- 87** How can warm-blooded organisms maintain a constant internal body temperature?
- (a) By relying on the environment through metabolism  
(b) Through metabolism  
(c) By seeking external heat sources  
(d) Through rapid cooling
- 
- 88** Examples of warm-blooded organisms include .....
- (a) Fish and amphibians (b) Invertebrates and arthropods  
(c) Birds and mammals (d) Reptiles and mollusks



89 Do the body temperatures of warm-blooded organisms change with changes in the surrounding environment?

- (a) Yes, they change significantly
- (b) Yes, they change slightly
- (c) No, they stay constant regardless of environmental temperature
- (d) No, they change only under extreme conditions

## Second Essay Questions

90 Write the scientific term that corresponds to each of the following statements:

- (1) The mass of a unit volume of matter at a certain temperature.
- (2) A device used to measure the density of liquids.
- (3) The movement of ocean water between regions, carrying heat, salts, and nutrients.
- (4) A physical property of water, varying with pressure, temperature, and salinity, causes ocean currents.
- (5) The sum of the potential and kinetic energies of the molecules of a body or system.
- (6) The energy transferred between two bodies of different temperatures.
- (7) The heat needed to raise the temperature of 1 kg of a substance by 1 °C or 1 K.
- (8) A transparent liquid with high specific heat that moderates coastal climate in summer.
- (9) Cool air moving from the sea surface to the land surface in the morning in coastal areas.
- (10) The thermal energy absorbed by a unit mass (1 kg) of a substance to change it from the liquid state to the gaseous state (vapor state) without a change in temperature.
- (11) A process used by living organisms to regulate their body temperature, in which evaporated water molecules carry heat away from the body.
- (12) A bond between water molecules that requires much energy to break during evaporation.

91 What are the results of:

- (1) Contact between two bodies of different temperatures.
- (2) Two balls of equal mass, one made of copper and the other of iron, gain the same amount of heat. (Given that the specific heat of copper is smaller than that of aluminum).
- (3) Cooking pots being made from a metal with relatively high specific heat.
- (4) Melting a piece of ice and then evaporating the liquid water, in relation to specific heat.
- (5) The strength of hydrogen bonds between water molecules, in relation to specific heat.
- (6) A decrease in air temperature from 4 °C to 0 °C, over a water surface.
- (7) Absorption of latent heat of vaporization by 1 kg of a substance.
- (8) The presence of hydrogen bonds between water molecules, in relation to its latent heat.
- (9) Water absorbing thermal energy without a change in its temperature during evaporation.
- (10) The high specific heat of water in oceans and lakes.
- (11) Cold-blooded organisms (Poikilotherms) depend on the surrounding temperature.
- (12) Warm-blooded organisms being able to maintain a constant internal body temperature.

92 Give reasons for the following:

- (1) The temperature of a body is considered a measure of its internal energy.
- (2) Copper heats faster than aluminum when equal masses receive the same amount of heat.
- (3) Water has a high specific heat.
- (4) Water plays a major role in moderating the climate of coastal cities in summer.



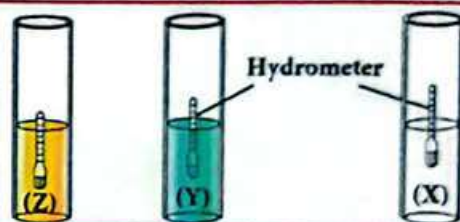
- (5) Cold-blooded organisms live at the bottom of seas and oceans.
- (6) Water has a high latent heat.
- (7) Living organisms use water evaporation as a mechanism to regulate their body temperature.
- (8) Most living organisms require a specific range of temperatures to survive.
- (9) A change in temperature leads to the death of coral reefs.
- (10) Cold-blooded organisms are often found in the depths of seas and oceans.

93 A graduated cylinder contains 50 ml of water, and the total mass of the cylinder with water is 70 g. After an object is carefully dropped into the cylinder, the water level rises to 80 ml, and the total mass becomes 90 g. Calculate each of the following:

- (1) The volume of the object.
- (2) The mass of the object.
- (3) The density of the object.

94 Compare between the absolute density of a substance and its relative density in terms of (definition – unit of measurement).

95 The opposite figure shows the measurement of the density of three liquids (X), (Y), and (Z) using the hydrometer. Arrange the three liquids in descending order according to their density.



96 The density of water at the bottom of the ocean varies, but in general, it is higher than at the surface, as density increases with depth and may reach  $1050 \text{ kg/m}^3$  or more in the ocean depths. In light of the previous statement, explain the reason for the increase in ocean water density with depth.

97 Explain the role of water currents resulting from variations in temperature and salinity in an aquatic environment.

98 The figure shows two lakes (A) and (B). Study them carefully, then answer:

- (1) Which lake is more exposed to depletion and loss of fish resources? Explain.



Lake (A)

The prevailing direction of water



Lake (B)

- (2) In which lake is pressure difference the main cause of water movement?

99 If the temperature of a piece of iron is 325 Kelvin, how much does this equal on the Celsius scale?

100 To heat a quantity of water from  $5^\circ\text{C}$  to  $100^\circ\text{C}$ , an amount of heat equal to 22500 J is required. Calculate the mass of water, given that the specific heat of water =  $4.184 \text{ J/g}^\circ\text{C}$ .

101 If the heat required to raise the temperature of 1 kg of aluminum by 1 K is 894 J, while the heat released by lowering the temperature of 1 kg of copper by 1 K is 358 J, which metal is more suitable for cooking utensils in terms of faster heat exchange, and why?

102 If a mass of 0.5 kg of lead gains 5000 J of thermal energy, and its temperature changes by  $76.9^\circ\text{C}$ , calculate the specific heat of lead.

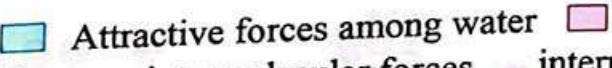


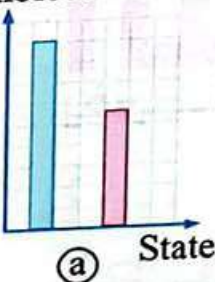


Questions marked with  are answered with explanations

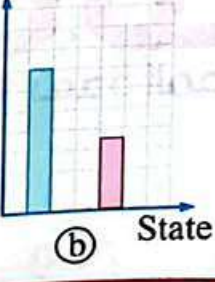
## First Multiple Choice Questions

- 1 When dissolving a certain amount of table salt in a cup of water, the result is .....
  - (a) A homogeneous mixture, where water is the solvent
  - (b) A heterogeneous mixture, where water is the solvent
  - (c) A homogeneous mixture, where water is the solute
  - (d) A heterogeneous mixture, where water is the solute
- 2 The colligative properties of solutions differ according to .....
  - (a) The type of solute
  - (b) The type of solvent
  - (c) The number of solute particles
  - (d) The specific heat of the solute
- 3 Which of the following is not considered a colligative property of solutions?
  - (a) Boiling point
  - (b) Freezing point
  - (c) Osmotic pressure
  - (d) Density
- 4 What is meant by the state of dynamic equilibrium between a liquid and its vapor?
  - (a) Evaporation stops while condensation continues
  - (b) Continuous increase in the number of liquid molecules
  - (c) Only evaporation occurs without condensation
  - (d) Evaporation and condensation occur at equal rates
- 5 Which of the following graphs represents the relationship between the attractive forces among water molecules and the attractive forces between water molecules and solute molecules?
 

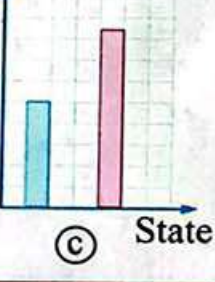




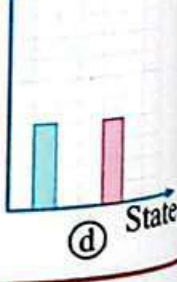
(a) State



(b) State



(c) State



(d) State
- 6 What is the main reason for the decrease in the vapor pressure of water in solutions compared to pure water?
  - (a) The bonding forces between water and solute molecules cannot be overcome
  - (b) Weakening of the hydrogen bonds between water molecules
  - (c) Solute particles reduce the number of water molecules at the surface that can evaporate
  - (d) Increase in the number of water molecules that can evaporate in the solution

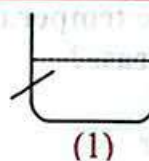


- 7 When comparing pure water with seawater, .....
- The vapor pressure of pure water is lower than that of seawater
  - The number of water vapor molecules above the liquid surface is greater in seawater
  - The vapor pressure of seawater is lower than that of pure water
  - The density of seawater is lower than that of pure water
- 8 When a quantity of a non-volatile substance is dissolved in one liter of distilled water, which of the following choices is correct?

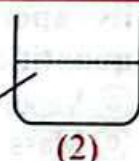
|     | Density   | Boiling point | Vapor pressure |
|-----|-----------|---------------|----------------|
| (a) | Decreases | Decreases     | Increases      |
| (b) | Decreases | Increases     | Decreases      |
| (c) | Increases | Increases     | Increases      |
| (d) | Increases | Increases     | Decreases      |

- 9 Study the opposite figure, then answer:  
Which of the following statements is correct regarding solutions (1) and (2)?

1 liter of pure water  
+  
1 g of table salt

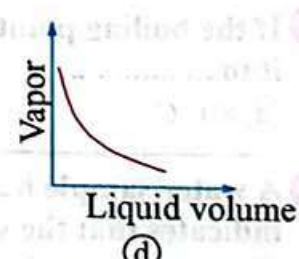
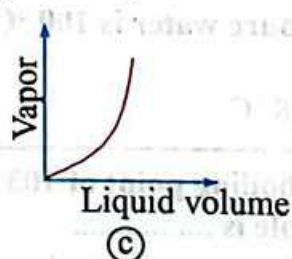
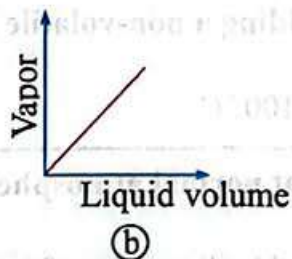
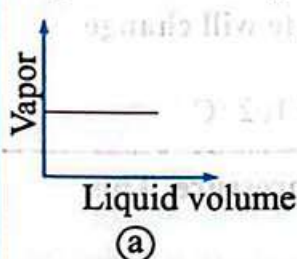


1 liter of pure water  
+  
2 g of table salt

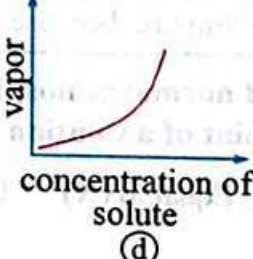
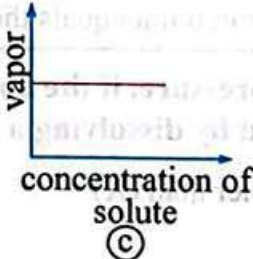
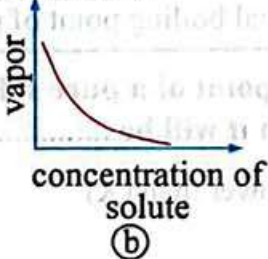
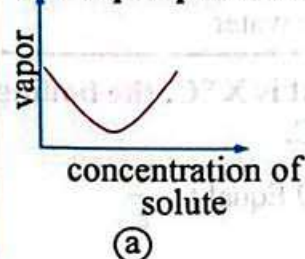


- The freezing point of solution (1) is lower than that of solution (2)
  - The boiling point of solution (1) is lower than that of solution (2)
  - The freezing point of solution (2) is higher than that of solution (1)
  - The boiling point of solution (2) is lower than that of solution (1)
- 10 What is the relation between the decrease in the vapor pressure of a solution and the number of solute ions in the solution?
- Direct
  - Inverse
  - Constant
  - Increasing then decreasing

- 11 Which of the following graphs correctly represents the relation between the volume of a liquid and its vapor pressure at constant temperature?



- 12 Which of the following graphs shows the relation between solute ion concentration and the vapor pressure of a solution?





- 13** Which of the following describes the relation between a solution's concentration and the rate of water evaporation?
- The rate of evaporation increases as concentration increases
  - The rate of evaporation decreases as concentration increases
  - There is no relation between concentration and evaporation rate
  - The relation depends on the type of solute
- 14** How does increasing solute particle number affect the properties of a solution?
- Increases the number of water molecules that can evaporate
  - Reduces the attractive forces between water and solute
  - Decreases the vapor pressure of the liquid
  - Has no effect on vapor pressure
- 15** The figure shows a closed container with a liquid in equilibrium with its vapor. When the temperature is decreased, which of the following quantities will increase?
- Vapor pressure
  - Mass of the liquid
  - Mass of the vapor
  - Rate of evaporation
- 
- 16** A liquid reaches its boiling point when .....
- All of its molecules are changed from the liquid state to the gaseous state
  - All of its molecules are changed from the liquid state to the solid state
  - The vapor pressure of the liquid equals the external pressure
  - The external pressure is greater than the vapor pressure
- 17** Two identical closed containers, one with pure water and the other with a sugar solution, are heated. Which will reach its boiling point first?
- Pure water
  - Sugar solution
  - They boil at the same time
  - It depends on the volume of the container
- 18** If the boiling point of pure water is 100 °C, adding a non-volatile solute will change it to .....
- 80 °C
  - 98 °C
  - 100 °C
  - 102 °C
- 19** A water sample has a boiling point of 103 °C at normal atmospheric pressure. This indicates that the sample is .....
- Pure, because its boiling point equals the normal boiling point of pure water
  - Pure, because its boiling point is higher than the normal boiling point of pure water
  - Impure, because its boiling point is higher than the normal boiling point of pure water
  - Impure, because its boiling point equals the normal boiling point of pure water
- 20** At normal atmospheric pressure, if the boiling point of a pure solvent is X °C, the boiling point of a solution formed by dissolving a salt in it will be ..... °C.
- Equal to (X)
  - Higher than (X)
  - Lower than (X)
  - Equal to  $\frac{X}{2}$



21 If the boiling point of a liquid is  $X^{\circ}\text{C}$  at sea level and  $Y^{\circ}\text{C}$  on top of a mountain, what is the ratio  $X : Y$ ?

- (a) Greater than one      (b) Less than one      (c) Equal to zero      (d) Equal to one

22 What is the expected boiling point of water at the top of Mount Everest, shown in the figure?

- (a)  $100^{\circ}\text{C}$       (b)  $120^{\circ}\text{C}$   
(c)  $102^{\circ}\text{C}$       (d)  $71^{\circ}\text{C}$



23 The boiling point of water varies with pressure. The correct order of boiling points for the same water sample at the following locations is .....

- (a) Top of a mountain > Sea level > 500 m below sea level  
(b) Top of a mountain > 500 m below sea level > Sea level  
(c) 500 m below sea level > Sea level > Top of a mountain  
(d) Sea level > 500 m below sea level > Top of a mountain

24 A student conducted an experiment to compare the boiling point of water under three conditions, as shown in the table.

|       |                                                   |
|-------|---------------------------------------------------|
| $T_1$ | Boiling point in a pressure cooker                |
| $T_2$ | Boiling point in an open pot at sea level         |
| $T_3$ | Boiling point in an open pot on top of a mountain |

Based on this, which of the following correctly represents the relationship between the three temperatures?

- (a)  $T_1 > T_2 > T_3$       (b)  $T_3 > T_2 > T_1$   
(c)  $T_1 = T_2 = T_3$       (d)  $T_3 > T_1 > T_2$



$T_1$



$T_2$



$T_3$

25 If the boiling point of acetic acid at 1 atm is  $118^{\circ}\text{C}$ , its expected boiling point at 0.8 atm is .....

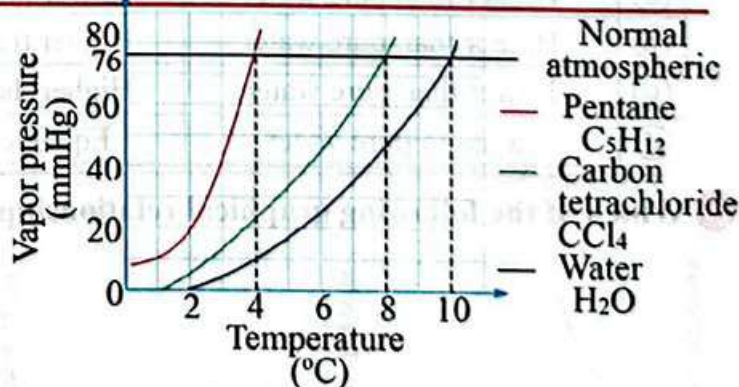
- (a)  $111^{\circ}\text{C}$       (b)  $118^{\circ}\text{C}$       (c)  $119^{\circ}\text{C}$       (d)  $125^{\circ}\text{C}$

26 What is the effect of dissolving a non-volatile substance in a given volume of pure water on the freezing point and vapor pressure, respectively?

- (a) Increases, increases      (b) Decreases, decreases  
(c) Increases, decreases      (d) Decreases, increases

27 The graph shows the variation of vapor pressure with temperature for three liquids. Which of the following represents the correct order of their boiling points?

- (a) Water < carbon tetrachloride < pentane  
(b) Carbon tetrachloride < water < pentane  
(c) Pentane < water < carbon tetrachloride  
(d) Pentane < carbon tetrachloride < water





28

If the following solutions have equal concentrations, which one has the highest boiling point?

(a) KCl

(b)  $\text{Na}_2\text{CO}_3$ (c)  $\text{Al}_2(\text{SO}_4)_3$ (d)  $\text{FeCl}_3$ 

29

The opposite figure shows the process of spreading amounts of salt on the road in cold regions after rainfall. Study it, then determine: What is the purpose of this?



- (a) To increase the freezing point of rainwater  
 (b) To increase the amount of snow on the road  
 (c) To prevent rainwater from freezing into ice  
 (d) To decrease the vapor pressure of rainwater

30

Which of the following types of water has the lowest freezing point?

(a) Drinking water

(b) River water

(c) Ocean water

(d) Freshwater Lake

31

If the following solutions have equal concentrations, which one has the highest freezing point?

(a) Ammonium chloride  $\text{NH}_4\text{Cl}$ (b) Aluminum chloride  $\text{AlCl}_3$ (c) Magnesium chloride  $\text{MgCl}_2$ (d) Aluminum sulphate  $\text{Al}_2(\text{SO}_4)_3$ 

32

If one mole of ..... is dissolved in one liter of water, it will cause the greatest depression of the freezing point.

(a) KI

(b)  $\text{MgCl}_2$ 

(c) NaCl

(d)  $\text{AlCl}_3$ 

33

Which of the following correctly describes the effect of adding a non-volatile solute to water?

- (a) The boiling point decreases, and the freezing point decreases  
 (b) The boiling point increases, and the freezing point decreases  
 (c) The boiling point decreases, and the freezing point increases  
 (d) Both the boiling point and the freezing point remain unchanged

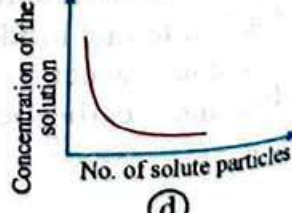
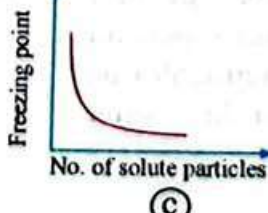
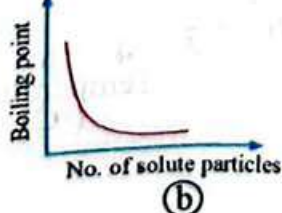
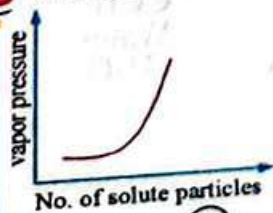
34

Which of the following choices shows the difference between pure water and a saline solution such as NaCl in terms of boiling point and freezing point?

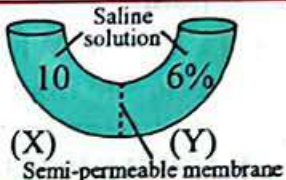
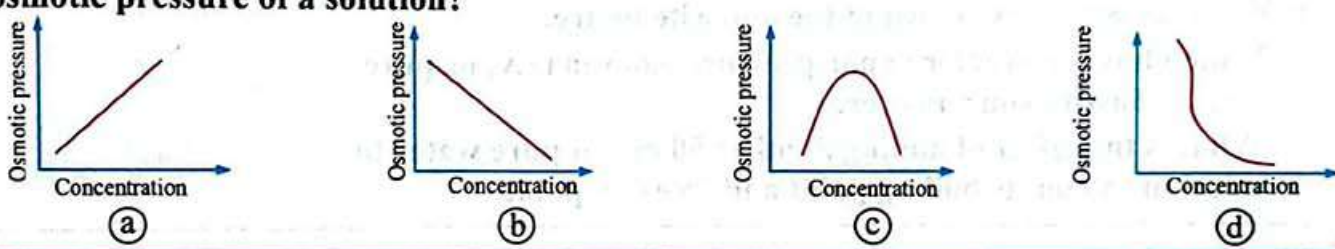
|     | Freezing point of the solution | Boiling point of the solution |
|-----|--------------------------------|-------------------------------|
| (a) | Higher than pure water         | Lower than pure water         |
| (b) | Higher than pure water         | Higher than pure water        |
| (c) | Lower than pure water          | Higher than pure water        |
| (d) | Equal to pure water            | Equal to pure water           |

35

Which of the following graphical relationships is correct for an aqueous solution?





- 36** The solution with the higher concentration has an osmotic pressure that is .....
- Higher, and it pulls water from the less concentrated solution
  - Higher, and it pushes water toward the less concentrated solution
  - Lower, and it pulls water from the less concentrated solution
  - Lower, and it pushes water toward the less concentrated solution
- 37** The movement of water between two solutions separated by a semipermeable membrane stops when both solutions .....
- Have the same temperature
  - Contain the same amount of water
  - Contain the same amount of solute
  - Have equal solute concentrations
- 38** In the figure, a 10% saline solution is placed on side (X) and a 6% saline solution on side (Y). What happens after some time?
- Salt moves from (X) to (Y)
  - Salt moves from (Y) to (X)
  - Water moves from (X) to (Y)
  - Water moves from (Y) to (X)
- 
- 39** Which of the following graphs shows the relation between solute concentration and the osmotic pressure of a solution?
- 
- 40** You have two cells, each weighing 8 nanograms. The first is placed in pure water, and the second in a concentrated sugar solution. What is the expected weight of each after one hour?
- Both: 6 ng
  - Both: 10 ng
  - First: 10 ng, Second: 6 ng
  - First: 6 ng, Second: 10 ng

## Second Essay Questions

- 41** Write the scientific term that corresponds to each of the following statements:
- A homogeneous mixture consisting of a solvent and a solute.
  - The state in which the rate of evaporation of a liquid equals the rate of condensation of its vapor at a certain temperature in a closed container.
  - The temperature at which the vapor pressure of a liquid equals the atmospheric pressure acting on its surface.
- 42** Correct the mistakes in the following statements:
- The colligative properties of a solution depend on the type of solute particles.
  - The vapor of a liquid formed above its surface exerts a pressure on the surface of the liquid called the osmotic pressure of the liquid.
  - The decrease in the vapor pressure of a solution is inversely proportional to the number of solute molecules or ions in the solution.
  - The freezing point of a solution is always equal to the freezing point of pure water at normal atmospheric pressure.
  - The boiling point of a solution is equal to the boiling point of pure water at normal atmospheric pressure.

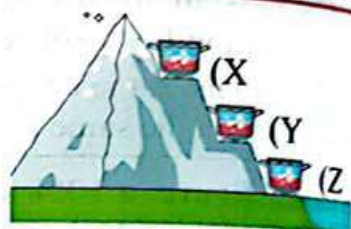


43 Give reasons for the following:

- (1) The boiling point of a solution is higher than that of pure water at the same atmospheric pressure.
- (2) Salt is spread on roads in cold regions after rainfall.
- (3) Colligative properties depend on the number of solute particles, not on their type.

44 The figure shows three containers, each with the same solution, placed at different heights above sea level.

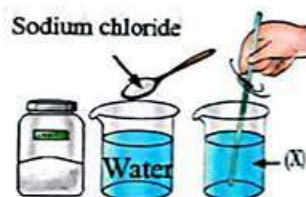
- (1) At which height does the solution have the highest boiling point?
- (2) Explain: Why the boiling point of the solution at height (X) is lower than its boiling point at height (Y).



45 According to your study, how can you determine the purity of a liquid?

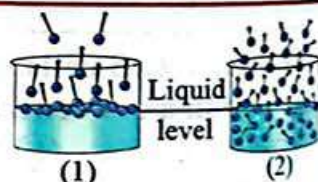
46 A saline solution (X) was prepared by dissolving 5 g of table salt in 50 mL of water, as shown in the opposite figure.

- (1) Which has the greater vapor pressure: solution (X) or pure water? Justify your answer.
- (2) What is the effect of adding another 50 mL of pure water to solution (X) on its boiling point and freezing point?



47 The opposite figure shows two containers (1) and (2) in the same room, each containing pure water at a different temperature.

- (1) What physical process is occurring in the water inside the two containers?
- (2) In which container is the difference between the vapor pressure of the water and the atmospheric pressure greater?



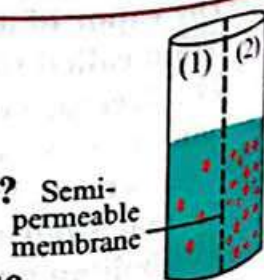
48 While conducting an investigation to measure the boiling point of water in different locations on Earth, it was found that pure water in Djibouti boils at a temperature higher than 100 °C. How can you explain this?

49 If compound (A) evaporates faster than compound (B) at 25 °C, answer the following:

- (1) Which compound has stronger intermolecular forces?
- (2) Which compound has a higher vapor pressure at 25 °C?
- (3) Which compound has a higher boiling point?

50 The opposite figure shows a container holding two sucrose solutions of different concentrations separated by a semipermeable membrane. Study it carefully, then answer:

- (1) Which of the two solutions will increase in volume after some time? Why?
- (2) Which of the two solutions will increase in concentration after some time? Why?





حمل الآن

مجاناً وحصرياً

# المراجعة رقم (3)

اختبار شهر اكتوبر





# Unit One Aquatic ecosystem

## Lesson (1) :- Aquatic Ecosystem

**\*Environment:-** Everything surround us.

Environment word is derived from a French word called (Environ).

### Components of the environment

#### 1-Biotic Factors (Living factors) :-

Plants, animals, Human and micro-organisms (Bacteria and Fungi).

#### 2- Abiotic Factors (Non-living factor):-

Light, air, water and soil (physical and chemical factors).

3- There is interactions between Living factors (biotic) and non -living factors (Abiotic) .

#### Biotic Factors



Vs

#### Abiotic Factors



**\*\*Environment is an integrated system, its components can't be Separated.**

**\* This system consists of:**

**Physical**

**Chemical**

**Biological factors**





## \* Ecosystem:

It is a community of living organisms and non -living organisms that interact with each other to adapt with any change.

\* The natural ecosystem consists of four interconnected spheres as:-

\* Ecosystem:

**Examples of ecosystems:**

Aquatic – Deserts - Forests

**Sphere of the natural environment**

1- Hydrosphere

2- Atmosphere

3- Lithosphere

4- Biosphere



These spheres are in continuous changes and are affected by human activities.

**Total amount of water on Earth's surface.**

Water covers about 70%.

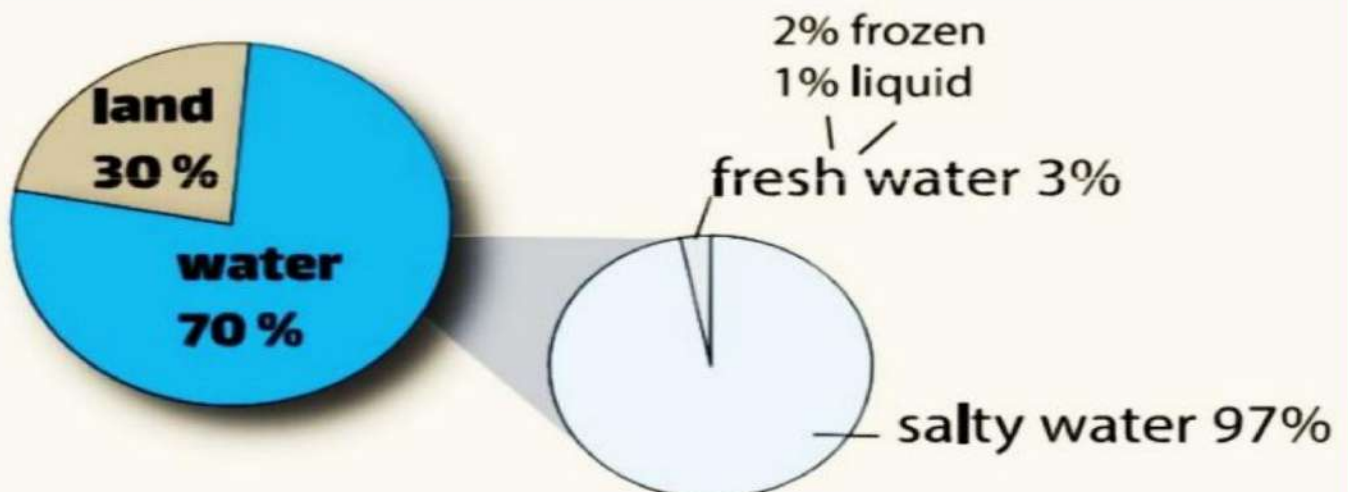
Land represents 30%

3% Fresh water

**97% salty water**  
Found in oceans, seas, and salt lakes.

**1% fresh water**  
- rivers,  
- Lakes  
- Ground water  
- Water tables

**2% Fresh water as frozen water.**  
- Polar ice caps  
- Mountain peaks.  
- Glaciated rivers.





It is the continuous motion of water (present on the Earth's surface or near to it from a place to another around the Earth in closed system in the three states (solid, liquid and gaseous)).

\*The water cycle as a system is capable of changing the Earth's surface **physically, chemically and biologically**.

## The water cycle includes:-

**1- Evaporation:** It is the change of water from Liquid to gaseous state.

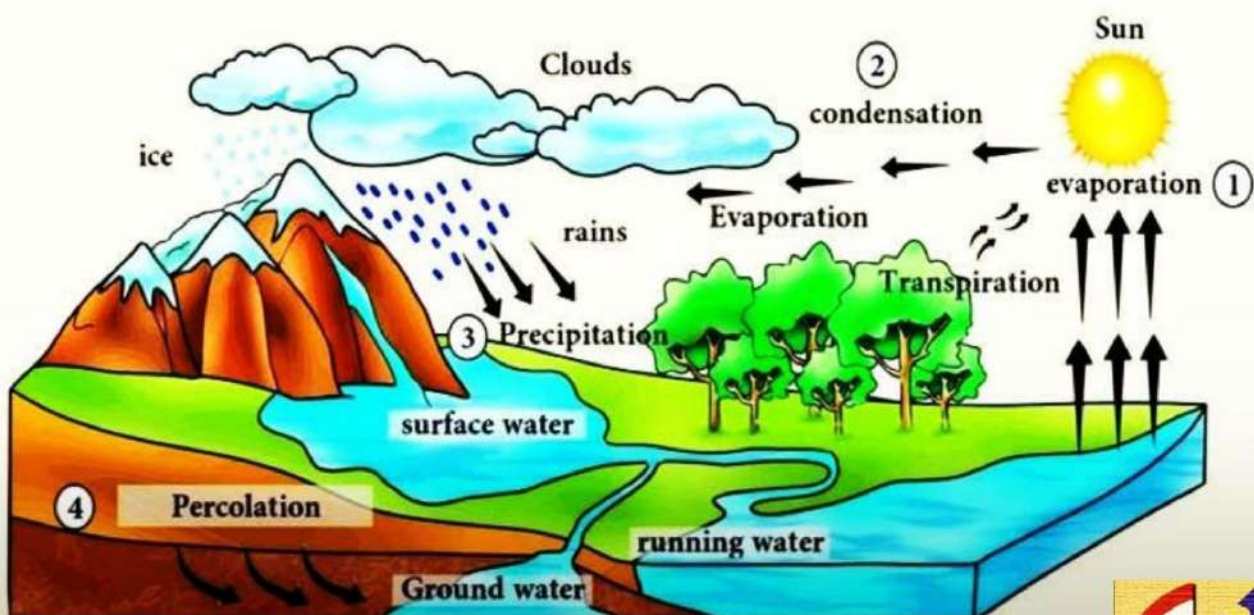
Evaporation processes as:

- \* **Respiration** of plants and animals.
- \* **Excretion** of plants and animals.
- \* **Transpiration** in plants only.

**2- Condensation:** contributes to the formation of clouds.

**3- Precipitation:-** the process of rainfall or snow fall.

**4- Percolation:-** water leaks through soil pores and sedimentary rocks to Form ground water.



Supervisor: Mrs. Dalia Faray

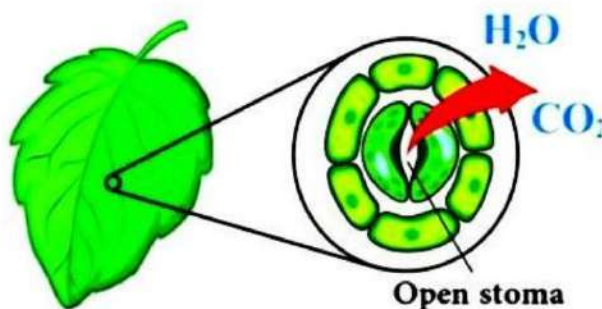
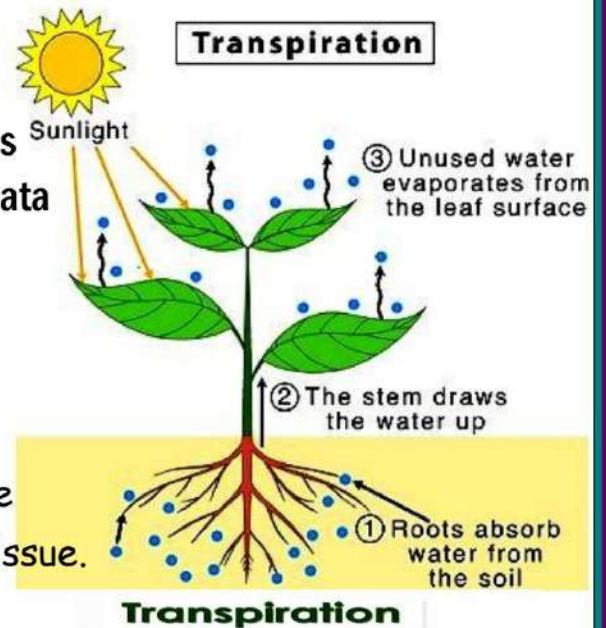


**Transpiration** It is the loss of excess water in the form of water vapor from the plant surface.

**Transpiration** occurs through microscopic holes on the plant leaves and green stems called Stomata

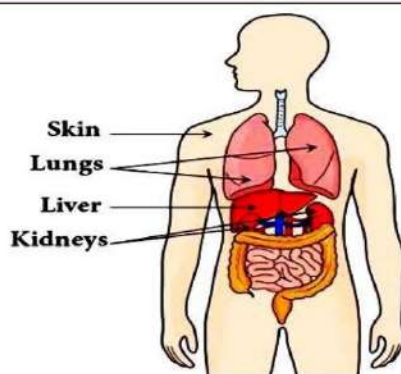
### Importance of Transpiration:-

- 1- Decrease the temperature of the plant.
- 2- Transpiration creates force called **transpiration pull force**, Helps the plant to absorb water and salts from root to the upper parts of the plant through Xylem tissue.



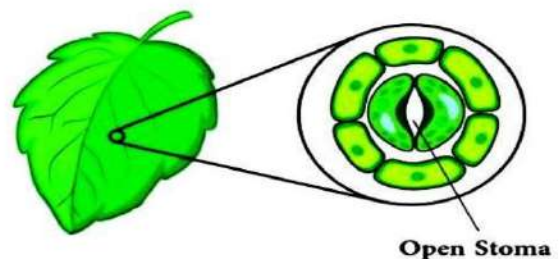
**Excretion:-** is the process in which the living organisms get rid of wastes produced from metabolism as carbon dioxide, water vapour and nitrogenous wastes (Ammonia, Urea and Uric acid).

#### In Human



- Respiratory organs: Lungs
- Excretory organs: Skin, lungs, liver, kidneys

#### In Plant



- Excretion and respiration: Stomata

**Transpiration helps in lifting water and minerals from the soil through the xylem vessels that are found in the root and extend to the stem and leaves, as follows:**

- 1 Evaporation of water through the stomata (transpiration).
- 2 Transpiration creates a pulling (suction) force as a result of water loss from the leaf.
- 3 The pulling force draws water upward through the xylem vessels.
- 4 Water passes from the root to the stem to compensate for the water lost from the leaves.
- 5 The plant absorbs new water from the soil, and the process is repeated.



## Lesson (2) chemical properties of water

### Water (H<sub>2</sub>O) chemically:

- 1- Water is a transparent medium (**light passes through it**).
- 2- Water can dissolve many chemicals as **table salt**.

### Water (H<sub>2</sub>O) physically:

Water exists in three states of matter (**solid, liquid and gas**) within the temperature range known on Earth.

### Three States of Water



Ice  
(Solid)



Water  
(Liquid)



Water vapors  
(Gas)

### Water (H<sub>2</sub>O) biologically:

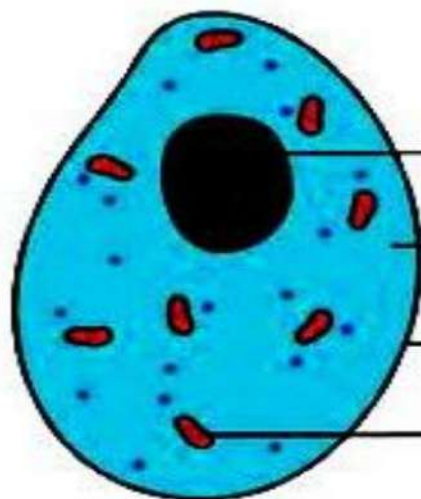
Water is essential for life continuity on the Earth. (**Explain**)

Because every cell of a living organism is surrounded by a **plasma membrane**.

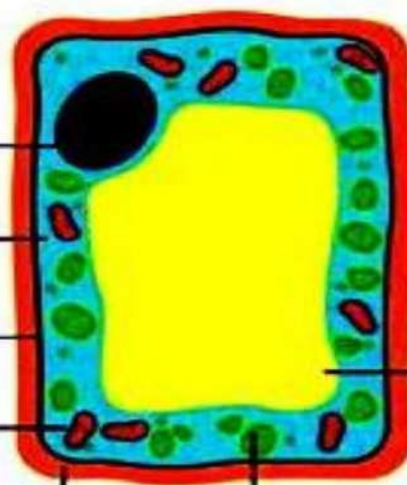
**\* Water passes through plasma membrane to carry substances that needed by the organisms to produce energy.**

**\* Water removes wastes from inside the cell to outside the cell through plasma membrane.**

Animal cell



Plant cell



Nucleus

Cytoplasm

Cell membrane

Mitochondria

Vacuole

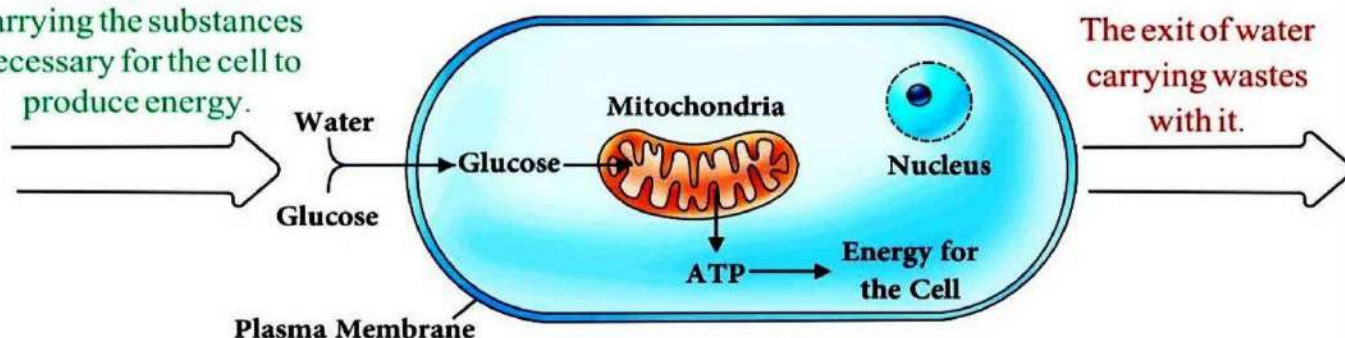
Cell wall

Chloroplasts





The entry of water carrying the substances necessary for the cell to produce energy.



## Chemical structure of water:

★ **Water ( $H_2O$ ) consists of 3 atoms (2 atoms of hydrogen and one atom of oxygen)**

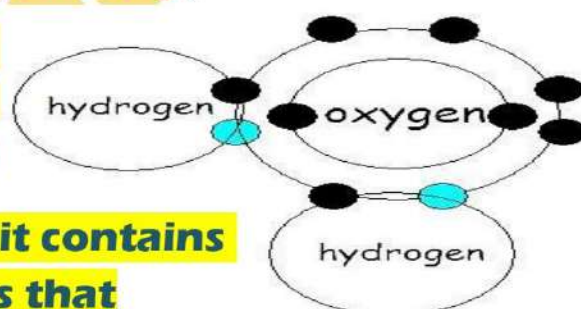
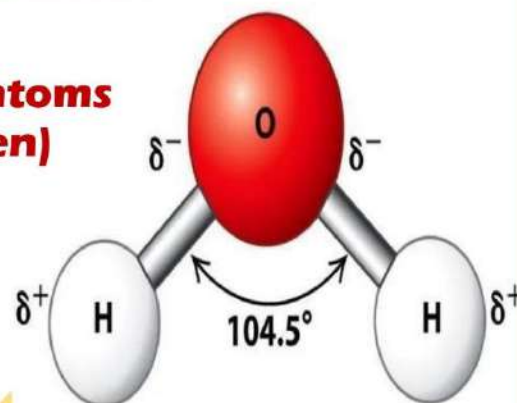
★ **The two hydrogen atoms are linked to the oxygen atom by two single covalent bonds, forming an angle about  $104.5^\circ$  between them.**

★ **The ratio between the mass of hydrogen and oxygen is 1:8 (respectively).**

★ **Oxygen represents 88.89%.**

★ **Hydrogen represents 11.11%.**

★ **Water does not exist on the Earth's surface in a pure form, as it contains many ions and chemical materials that interact with it in different ways.**



## Covalent bond:-

It is the a type of chemical bond between two atoms each one share with one or more electrons to form the bond

## Properties of water:

### 1-The polarity of water:

**Water is a polar compound. (Explain)**

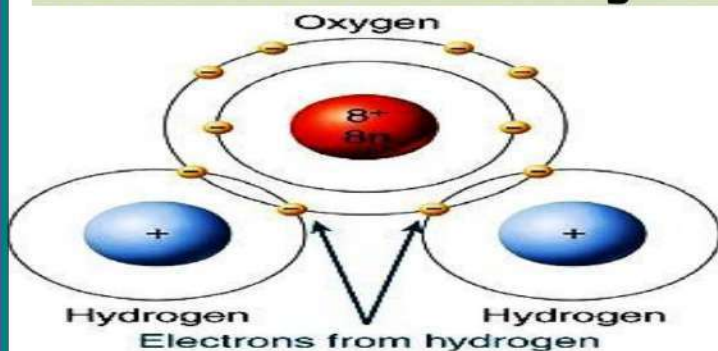
**Because oxygen is more electronegativity than the hydrogen atom.**

**so the bond electrons are attracted towards the oxygen atom, forming a partial negative charge on the oxygen atom and a partial positive charge on the hydrogen atom.**

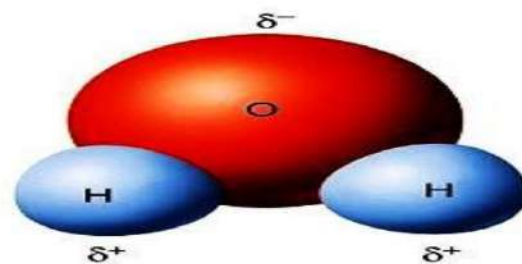


## Electronegativity

It is the ability of the atom to attract electrons of the chemical bond to itself longer time.



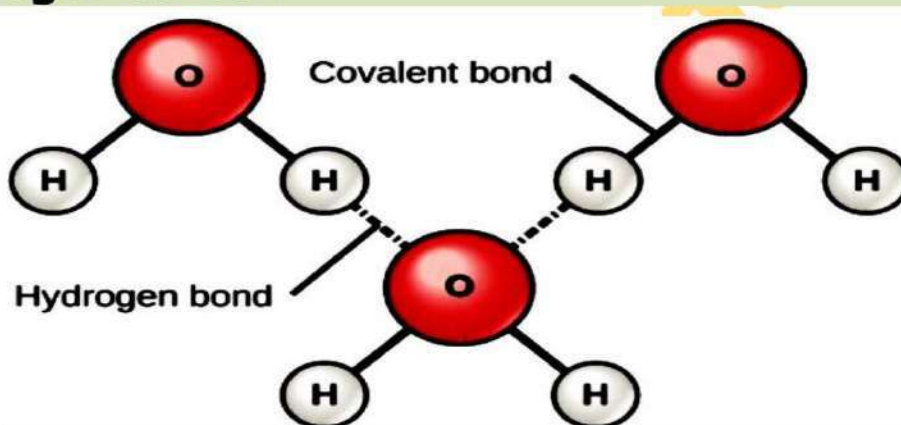
(a) Electron shells in a water molecule



(b) Distribution of partial charges in a water molecule

## The polarity of the water molecule causes:-

The connection of water molecules with each other in what by hydrogen bonds .



Each water molecule may be surrounded by four hydrogen bonds with neighboring water molecules forming a web of Hydrogen bonds give the unique properties of water.

## Hydrogen bond

It is the electrostatic attraction between the partially +ve charge of hydrogen in a water molecule and the partially negative charge of oxygen in another neighboring atom.

## Results of water polarity

- 1-Forming hydrogen bonds with polar molecules of other materials, which gives water the ability to dissolve many salts and break them down into hydrated ions.
- 2- The rising of boiling point of pure water, which reaches 100° C under normal atmospheric pressure compared to the boiling point of compounds similar to it in composition such as hydrogen sulphide, which boils at (-61° C)



|                                       | Water                                                                                                       | Hydrogen Sulfide                                                                                            |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| Chemical Formula                      | $\begin{array}{c} \cdot\cdot \\ \text{O} \\ \diagup \quad \diagdown \\ \text{H} \quad \text{H} \end{array}$ | $\begin{array}{c} \cdot\cdot \\ \text{S} \\ \diagup \quad \diagdown \\ \text{H} \quad \text{H} \end{array}$ |
| Electronegativity of the Central Atom | High                                                                                                        | Low                                                                                                         |
| Hydrogen Bonds                        | Exist between water molecules                                                                               | Do Not Exist                                                                                                |
| Molecular Mass                        | Low                                                                                                         | High                                                                                                        |
| Boiling Point                         | 100°C                                                                                                       | -61°C                                                                                                       |
| Type of Bonds between its Atoms       | Two Covalent Bonds                                                                                          |                                                                                                             |

## 2-Water is a common solvent

Water has the ability to dissolve polar covalent compounds and ionic compounds as water is a polar compound.

**What happen when adding of ionic compound (table salt) to water.**

When ionic compounds are added to water

The crystal lattice dissociates into free ions surrounded by water molecules.

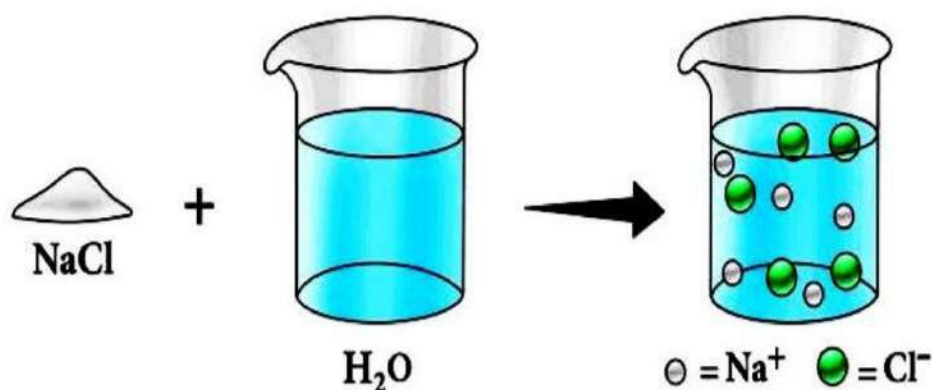
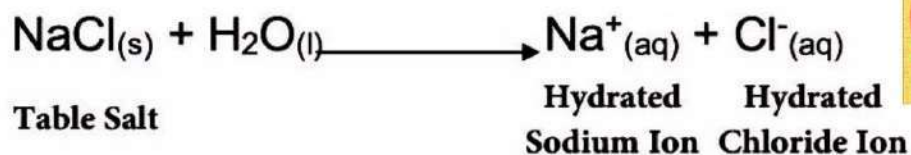
Water molecules prevent the ions from recombining.

Negative ions are attracted to the positive pole of water molecules (hydrogen atoms).

Positive ions are attracted to the negative pole of water molecules (oxygen atoms).



**- Example:** The dissolution of sodium chloride (table salt) in water.

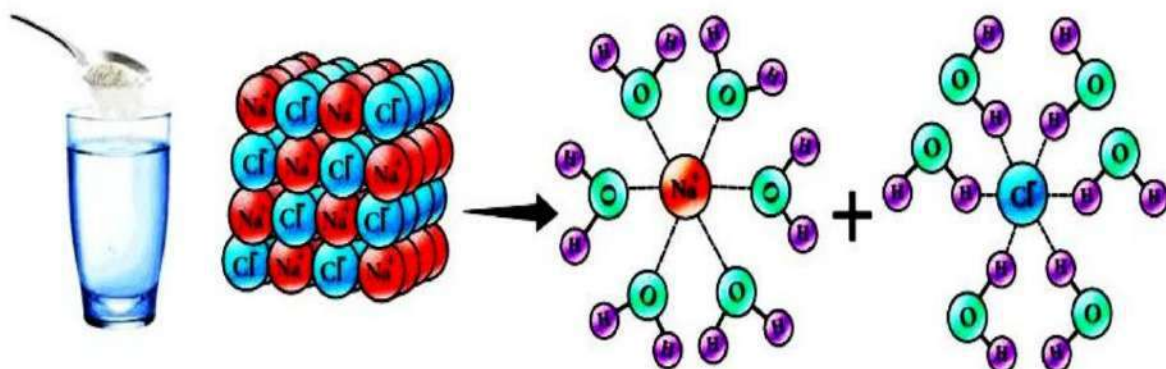


**2**

The positively charged sodium ion is surrounded by the partial negative charge of the oxygen atoms in the surrounding water molecules.

**2**

The negatively charged chloride ion is surrounded by the partial positive charge of the hydrogen atoms in the surrounding water molecules.

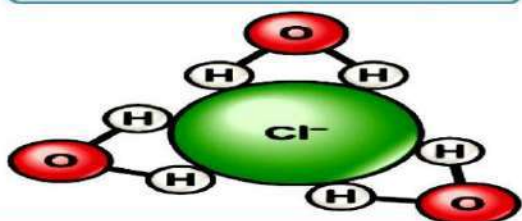


**1**

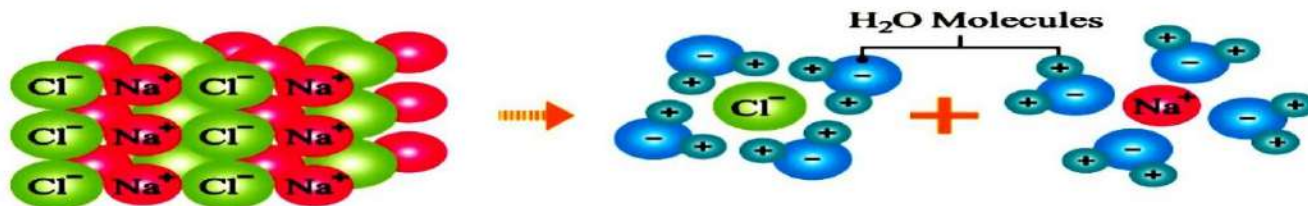
When sodium chloride crystals (an ionic compound), are added to water, the sodium chloride molecules dissociate into ions ( $\text{Na}^+$ ) and ( $\text{Cl}^-$ ), and the water molecules surround the ions.

**3**

The salt ions remain in the solution without binding to the water ions; therefore, the dissolution of sodium chloride in water is not considered hydrolysis, because the ions resulting from the dissociation of the salt do not react with water to form new acids or bases.





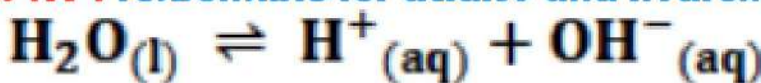


### 3-The ionic equilibrium of water.

**Pure water ionizes very slightly.**

**Because some of water molecules dissociate to form:**

**Hydrogen ions ( $\text{H}^+$ ) responsible for acidity and hydroxide ions ( $\text{OH}^-$ ) alkalinity.**



**These ions are present in equal concentrations which makes pure water neutral.**



Responsible for Alkalinity



Responsible for Acidity

### 4-Water Hydrolysis of salts:

#### Hydrolysis

- \* It is a reaction occurs when dissolving a solid salt in water forming an **acid and a base**.
- \* One of them or both are weak.





## Types of salts according to hydrolysis

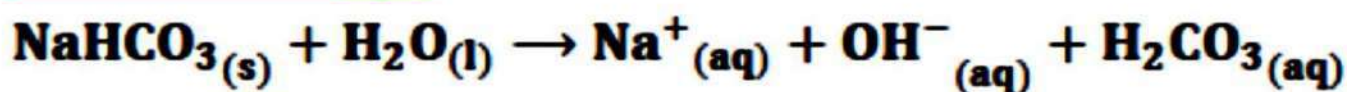


| P.O.C.                                        | 1-Acidic salt                             | 2-Basic salts                              | 3- Neutral salts                             |
|-----------------------------------------------|-------------------------------------------|--------------------------------------------|----------------------------------------------|
| 1. When dissolving in water                   | Hydrolyzed                                | Hydrolyzed                                 | Hydrolyzed                                   |
| 2- Concentration of Hydrogen ions ( $H^+$ )   | Increase                                  | Decrease                                   | Not affected                                 |
| 3- Concentration of Hydroxide ions ( $OH^-$ ) | decrease                                  | Increase                                   | Not affected                                 |
| 4-Examples                                    | Dissolving of Ammonium chloride in water. | Dissolving of Sodium bicarbonate in water. | Dissolving of Ammonium bicarbonate in water. |

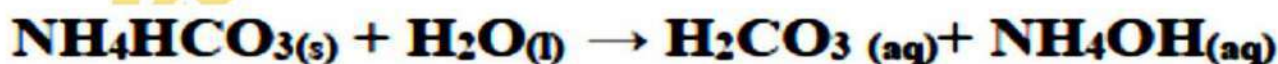
### Acidic salts ( $NH_4Cl$ )



### Basic salts ( $NaHCO_3$ )



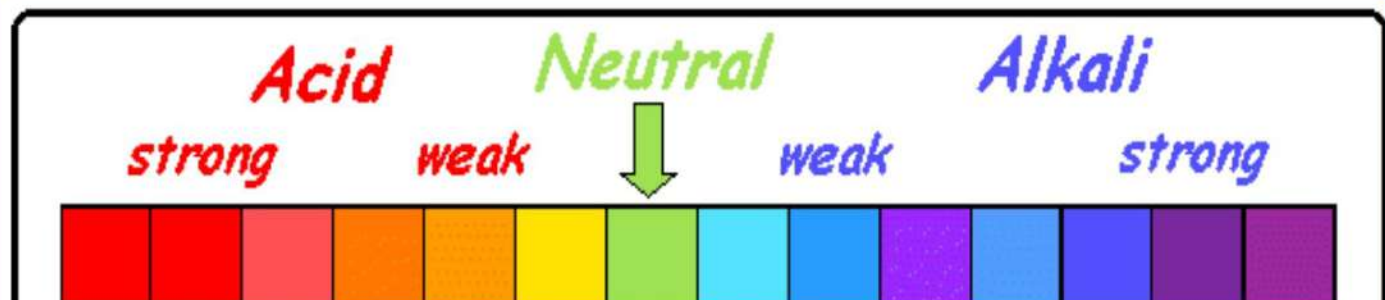
### Neutral salts ( $NH_4HCO_3$ )



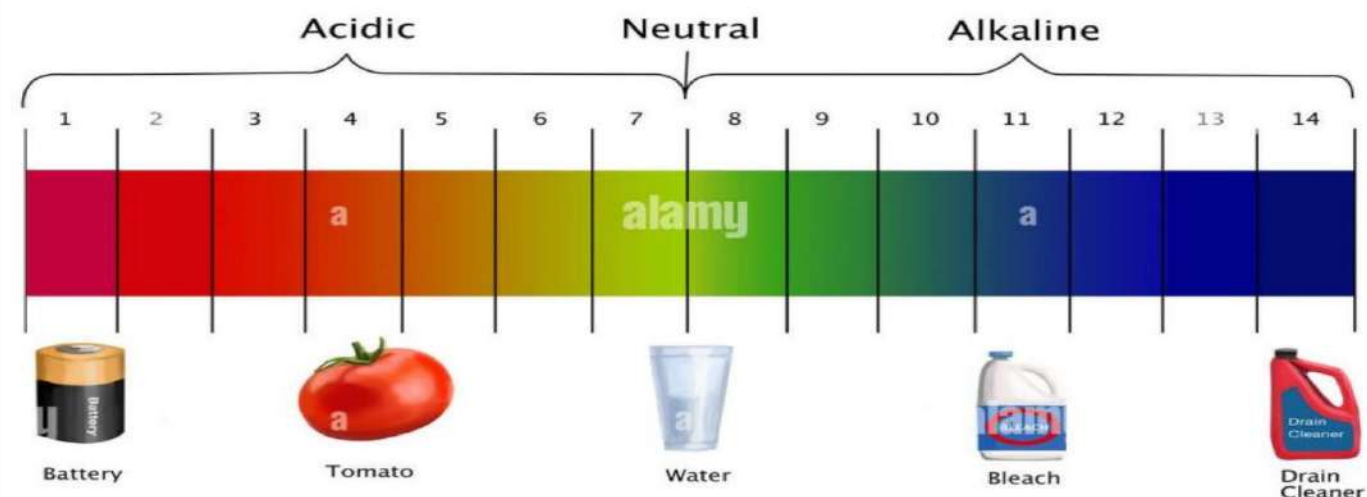
### The pH value :

It is a graduated measurement from 0 to 14 that expresses the acidity, alkalinity or neutrality of the solution.





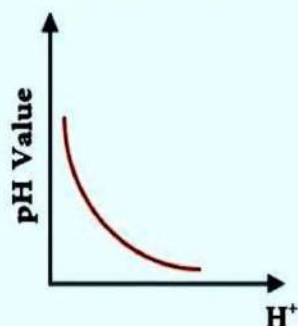
The PH Scale



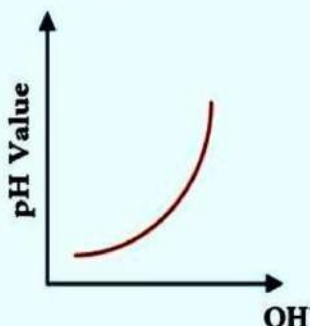
• Water can be classified according to the pH value as follows:

| Nature of Water            | Acidic                                                 | Neutral                              | Alkaline                                                  |
|----------------------------|--------------------------------------------------------|--------------------------------------|-----------------------------------------------------------|
| pH Value                   | Less than 7                                            | Equal to 7                           | Greater than 7                                            |
| Ion Concentration in Water | Increase in $H^+$ concentration<br><br>Acidic Solution | $H^+ = OH^-$<br><br>Neutral Solution | Increase in $OH^-$ concentration<br><br>Alkaline Solution |

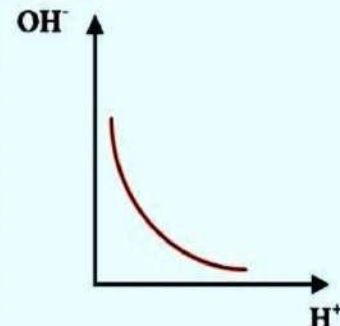
The relation between hydrogen concentration and the pH value.



The relation between hydroxide concentration and the pH value.



The relation between the concentration of hydrogen and hydroxide in the solution.





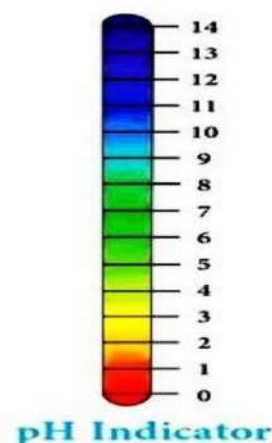
## Measuring the variation of pH in different water samples:

By using pH meter or

pH indicator strips

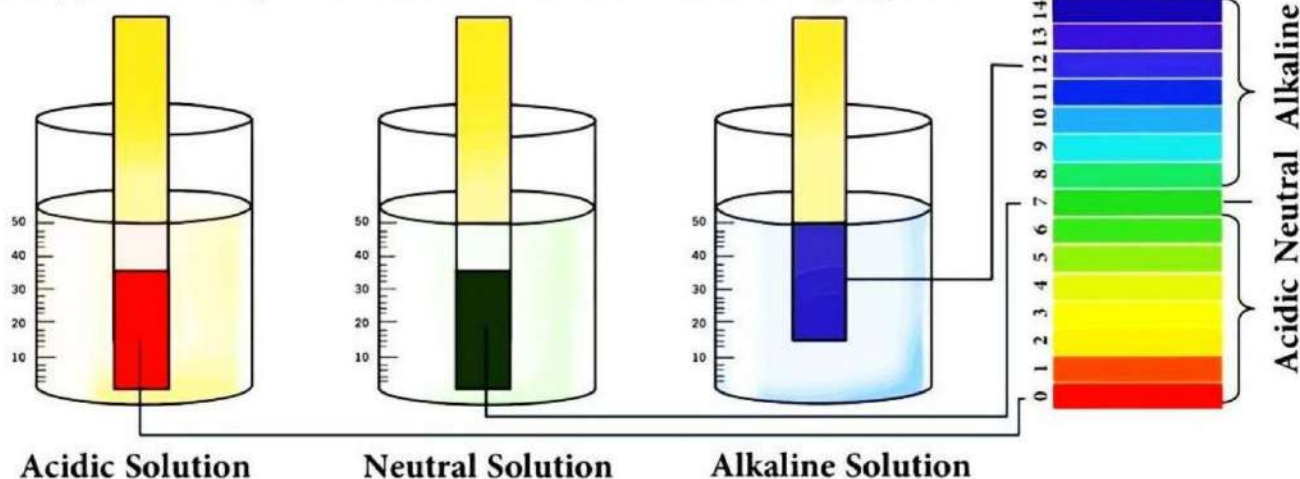


pH Meter



pH Indicator

When using pH test strips, the strip changes color according to the solution (acidic - basic - neutral). The strip is then compared with the provided chart to determine the approximate pH value, as shown in the following figure:



Acidic Solution

Neutral Solution

Alkaline Solution

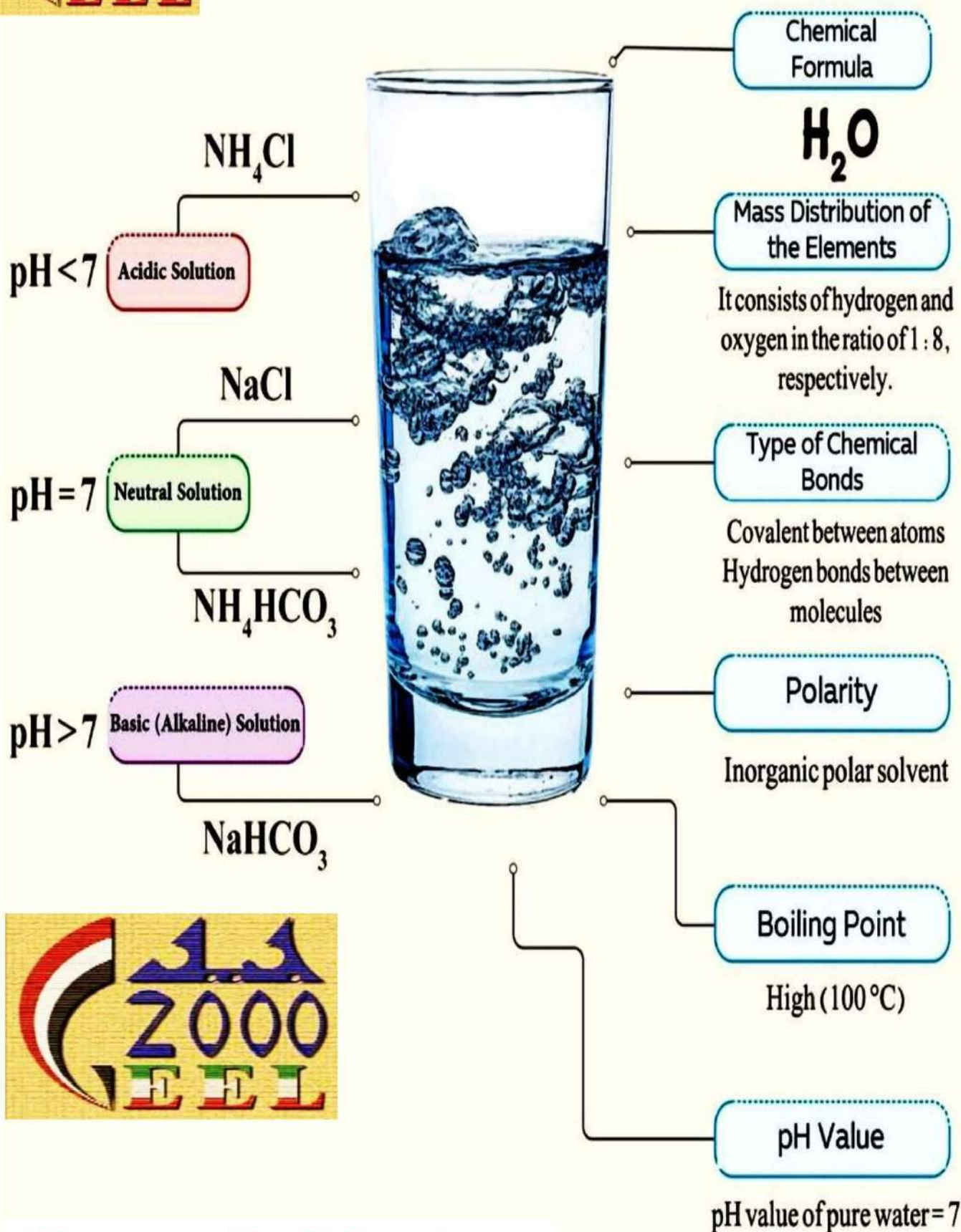
| Substance                    |        | pH Value               |
|------------------------------|--------|------------------------|
| Pure water (Distilled water) |        | 7                      |
| Sea water                    |        | Ranges from 7.5 to 8.4 |
| Fresh water                  | Rivers | Ranges from 6.8 to 7.8 |
|                              | Lakes  | Ranges from 7.3 to 8.5 |
| Ground water                 |        | Ranges from 6 to 8.5   |
| Clouds                       |        | Ranges from 4.5 to 5   |
| Mine water                   |        | Ranges from 3 to 4     |

- The values presented in the table are approximate and may vary depending on different environmental factors and human activities in the area, which affect the pH value of the water.





# Properties of Water



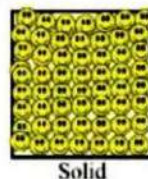
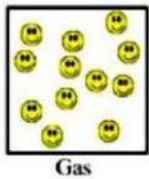


## Lesson (3)

### The physical properties of water and their role in the distribution of living organisms

#### 1. DENSITY:

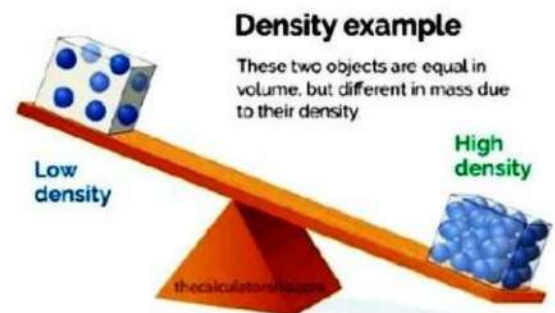
*Mass per unit volume of a substance at a specific temperature*



Water's density depends on

- Mass of its molecules .
- Spaces between molecule.

$$\rho = \frac{m}{Vol} \rightarrow kg/m^3$$



#### RELATIVE DENSITY:

*The ratio of its density to the density of water at the same temperature.*

$$\rho_r = \frac{\rho_m}{\rho_w} \rightarrow \text{Unitless}$$

#### HYDROMETER

*Instrument used to measure the density or relative density of liquids.*

Hydrometer consists of

- A sealed, hollow glass tube with a wider base for buoyancy.
- Lead or mercury balls at the bottom for balance.
- A long, thin, graduated stem to indicate density readings.

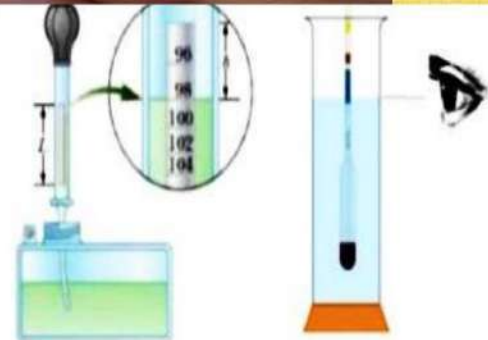




# How to Use a Hydrometer



- The lower scale on the hydrometer shows the highest density it can measure.
- The upper scale shows the lowest density it can measure.

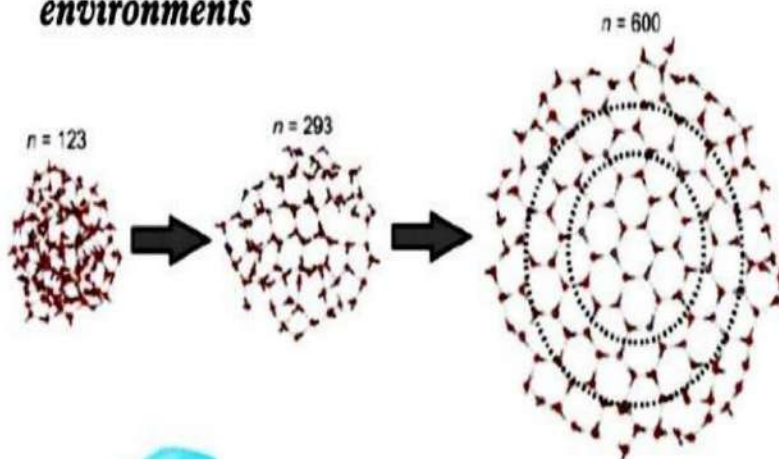


## Physical Properties of Water:

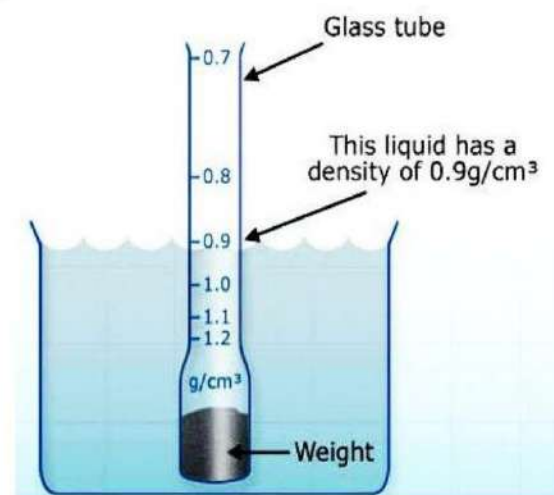
Water has unique physical properties that distinguish it from other fluids (liquids and gases):

1. The decrease in its density when it freezes

2. The increase in its specific heat, which affects many natural phenomena and the distribution of living organisms in different environments



## Hydrometer





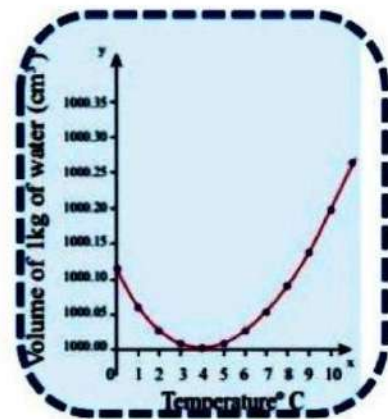
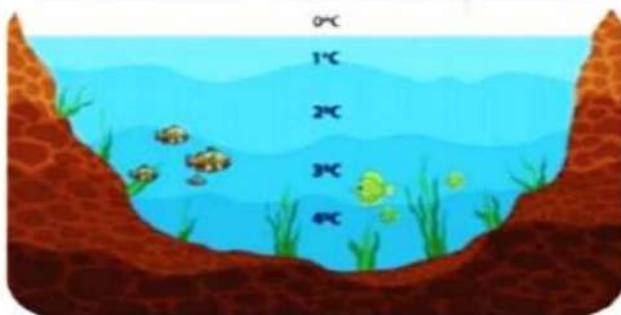
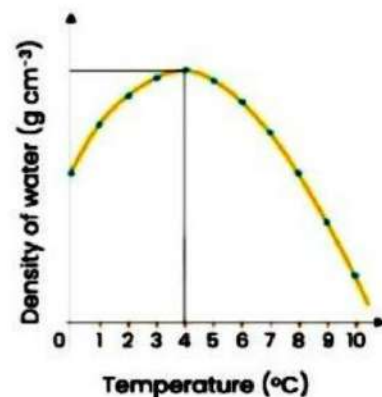
## Density of water in Polar Regions



- Generally, the volume of liquids increases with rising temperature and decreases with lowering temperature.
- **Water Exception:**
  - From  $0^{\circ}\text{C}$  to  $4^{\circ}\text{C}$ , water shrinks as temperature increases, and its density increases.
  - Water reaches its highest density ( $1000 \text{ kg/m}^3$ ) at  $4^{\circ}\text{C}$ .
  - Above  $4^{\circ}\text{C}$ , water expands, and its density decreases.

### EXPLANATION IN POLAR REGIONS (FREEZING OF LAKES)

- As air temperatures drop between  $4^{\circ}\text{C}$  and  $0^{\circ}\text{C}$ , surface water expands and becomes less dense than the water below.
- The surface water freezes first, and the ice remains on top because it is less dense than liquid water.
- Water at  $4^{\circ}\text{C}$  stays at the bottom, allowing fish and other marine life to survive under the ice.
- As the temperature of the water decreases until it reaches  $4^{\circ}\text{C}$  → the molecules get closer together → occupy less volume → their density increases.
- When the water temperature drops below  $4^{\circ}\text{C}$  → its density decreases





# Water Density and Ocean Currents



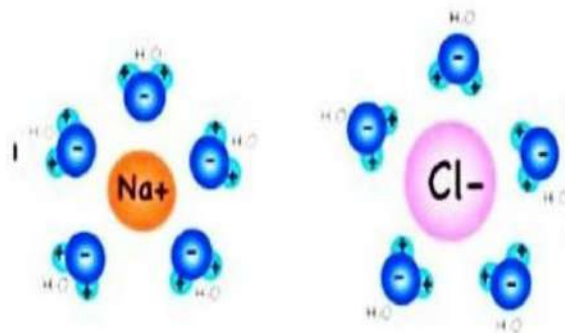
## FACTORS AFFECTING WATER DENSITY:

### 1. Pressure:

- As pressure increases with depth in the ocean, water molecules are forced closer together, increasing density.
- In shallow water, the density of water does not change with increasing depth **because it is incompressible.**

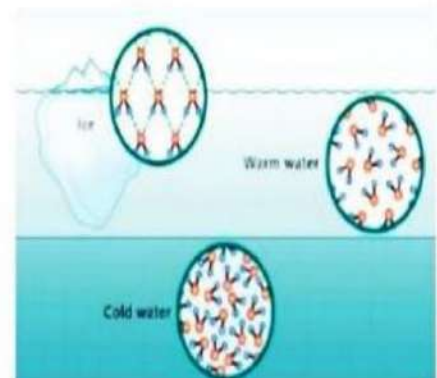
### 2. Salinity (Amount of Dissolved Salt):

- The more salt in the water, the higher the density.
- Average ocean salinity: 35 grams of salt per liter (about 2 teaspoons of salt per cup of water).



### 3. Temperature:

- As water cools, its molecules move closer together, increasing density.
- Water reaches maximum density at 4°C before it starts to freeze.

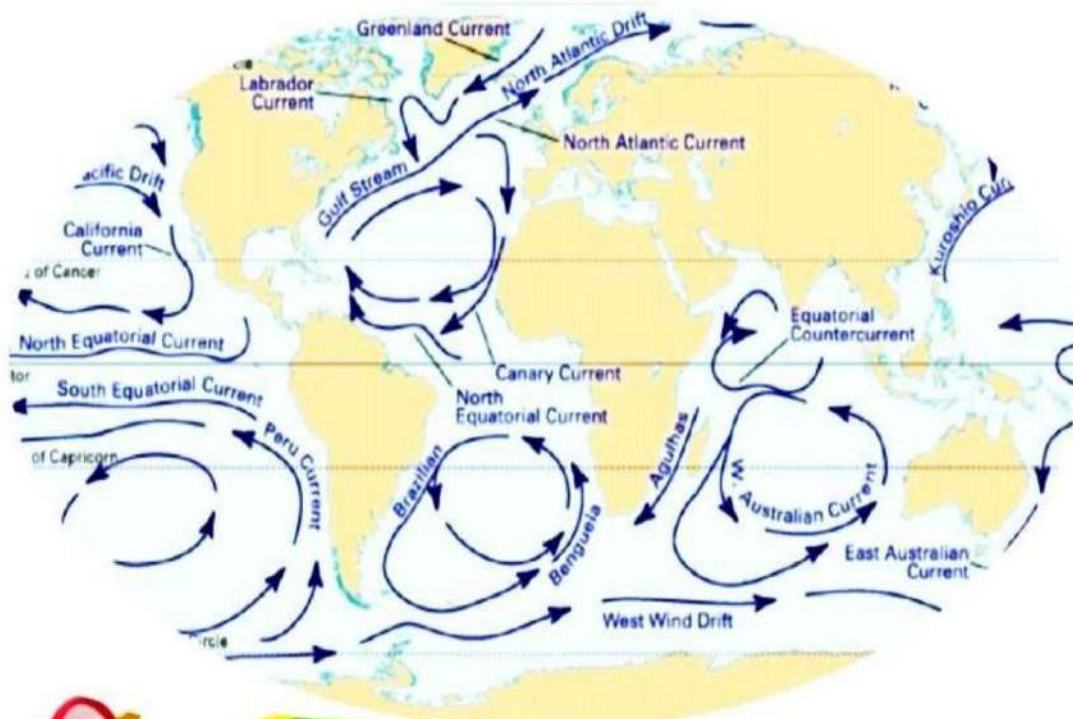




## IMPORTANCE OF WATER DENSITY IN OCEAN CURRENTS.



1. *Density differences drive the movement of ocean currents.*
2. *These currents play a critical role in:*
  - *Transporting heat and salt from tropical regions to the poles.*
  - *Moving nutrients from the deep ocean to the surface, supporting marine life.*
  - *Carrying fresh water from rivers and melting glaciers to various parts of the ocean.*



### Note

*When freshwater from melting icebergs or glaciers enters the ocean (saltwater), that freshwater spreads on the surface of the ocean and does not sink where this freshwater might freeze on the surface forming a thermal insulator between the deeper parts of the ocean and the cold atmospheric air above.*





## 2. QUANTITY OF HEAT + TEMPERATURE



- Any system contain large number of molecules, separated by space.

**This molecules have energy divided to**

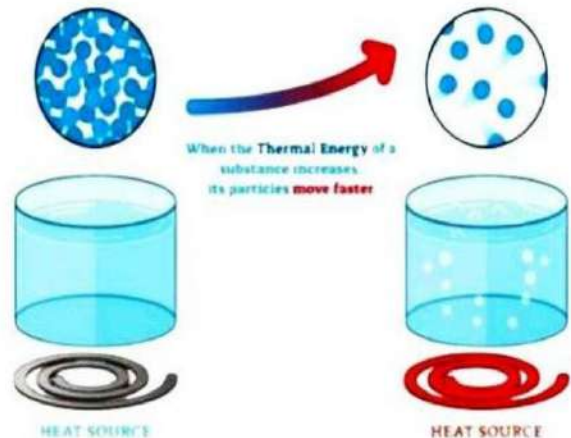
- Potential energy
  - resulting from the position of the particles relative to each other
- Kinetic energy
  - resulting from the motion of the particles



**THE SUM OF THEM CALLED INTERNAL ENERGY**

### QUANTITY OF HEAT

- it is the total amount of thermal energy present in a system.
- It is often measured in joules (J) or calories (Cal). It's a measure of the total thermal energy transferred between two systems.



### TEMPERATURE

it is a measure of the average kinetic energy of the particles in a substance, indicating how hot or cold something is



**Note**

When a body or system acquires an amount of thermal energy, the amplitude of vibration of its molecules increases, as does their kinetic energy, and thus its temperature rises.





QUANTITY OF HEAT

THERMAL ENERGY OF PARTICLE



TEMPERATURE

KINETIC ENERGY OF THE PARTICLES



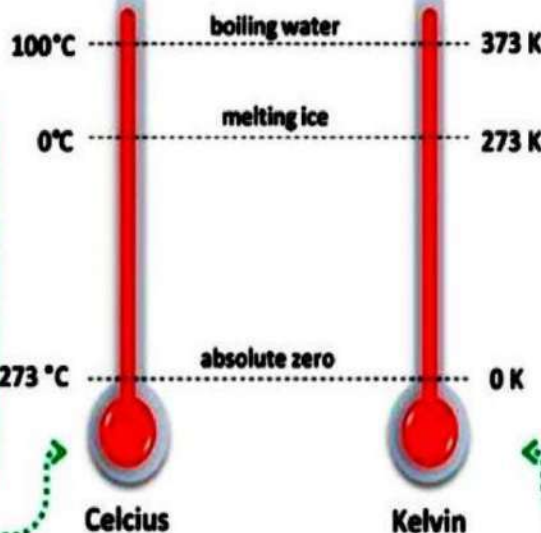
### How Measure temp.:

- It is typically measured in degrees Celsius (C), degrees Fahrenheit (°F), or Kelvin (K).
- It's a measure of the intensity of heat, not the total amount

Celsius to Kelvin  
 $K = ^\circ C + 273.15$

Kelvin to Celsius  
 $^\circ C = K + 273.15$

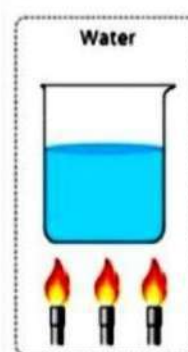
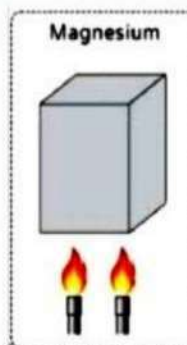
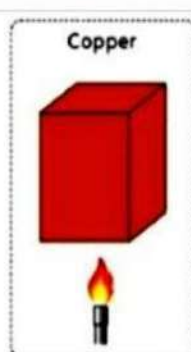
**Celsius (C):** This is the most used temperature scale in everyday life. It is based on the freezing point of water, which is defined as  $0^\circ C$ , and the boiling point of water, which is defined as  $100^\circ C$ .



**Kelvin (K):** This is an absolute temperature scale, meaning its zero point represents the lowest possible temperature that can be reached (absolute zero). This is equivalent to  $-273^\circ C$ .

$$\Delta t(^{\circ}C) = \Delta T(K)$$

**DOES A UNIT OF MASS (1 KG) OF DIFFERENT SUBSTANCES REQUIRE THE SAME AMOUNT OF HEAT FOR THEIR RESPECTIVE TEMPERATURES TO RISE BY ONE KELVIN**

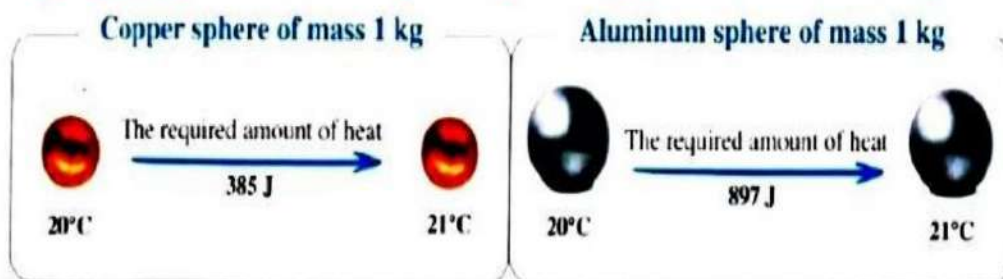




### 3. THE SPECIFIC HEAT

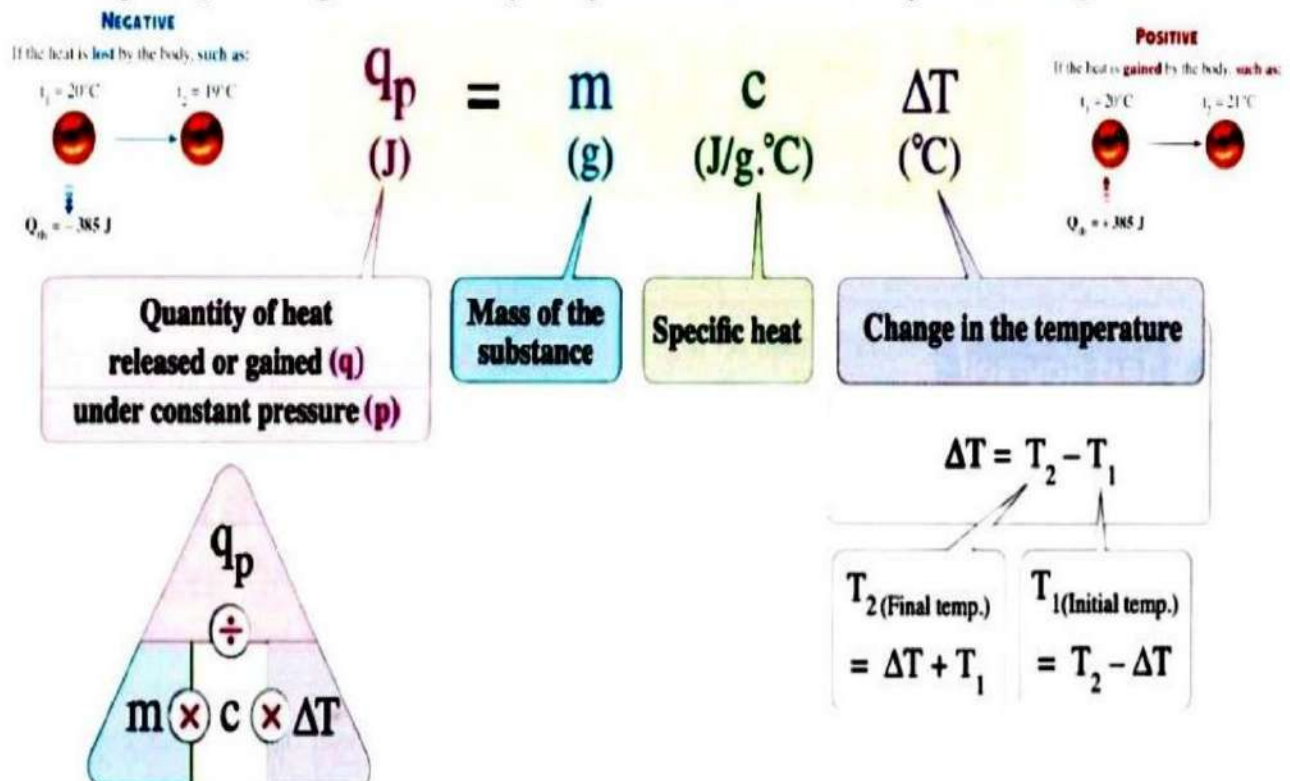


- amount of heat required to raise the temperature of one unit of mass of the substance by one unit of temperature.
- Units: Common units for specific heat are joules per kilogram per Kelvin ( $\text{J/kg.K}$ )
- depend on type of material and impurities and state
- Water's high specific heat: Water has a particularly high specific heat, meaning it takes a lot of heat energy to raise its temperature. *(This property is essential for regulating Earth's climate)*



### Calculation of the quantity of heat

\* The quantity of heat gained or lost by the system can be calculated by the following relation :

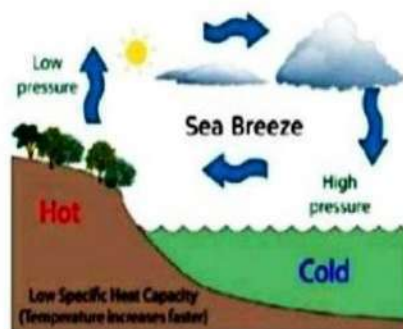




## 4. SEA BREEZE



The temperature of a large body of water during the summer is low compared to the temperature of beach sand and rocks. **Air over land heats up**, becomes **less dense**, and rises upward. **Cooler air** from above the surface of the water moves landward, and is called the **sea breeze**, to replace the hot air that has risen upward.



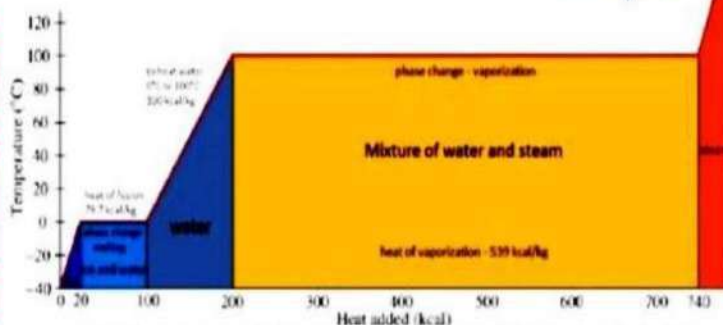
## 5. LATENT HEAT OF SUBLIMATION

The latent heat of vaporization is the thermal energy absorbed by a unit **mass (1 kg)** of a substance to change from the liquid state to the gaseous state (**vapor state**) without a change in temperature.

(OR RELEASED DURING ITS CHANGE FROM THE GASEOUS STATE (VAPOR) TO THE LIQUID STATE WITHOUT A CHANGE IN TEMPERATURE).



This is useful for many organisms, as they can use **water evaporation** as a mechanism to regulate their body temperature. When organisms **sweat or transpiration** occurs in plants, the evaporated water molecules carry heat away from the body.



**WATER HAS A HIGH LATENT HEAT DUE TO THE HYDROGEN BONDS BETWEEN ITS MOLECULES. FOR WATER TO EVAPORATE, THE HYDROGEN BONDS BETWEEN ITS MOLECULES MUST BE BROKEN, WHICH REQUIRES A LOT OF ENERGY.**



## 6. THE EFFECT OF TEMPERATURE CHANGES ON MARINE ORGANISMS:



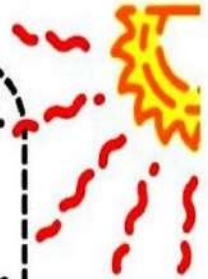
Temperature is a critical factor that influences the distribution, and behavior, of marine organisms that live in warm surface waters may be unable to survive in colder depths.

### HIGH SPECIFIC HEAT OF WATER

1. Water can absorb a lot of heat without getting much hotter. This helps keep ocean temperatures stable.

2. **Oceans as Heat Reservoirs:** Oceans and lakes store a lot of heat during the day and release it slowly at night.

**THIS HELPS KEEP TEMPERATURES IN THE SURROUNDING MARINE ENVIRONMENT STABLE.**



Note

Coral reefs need specific temperatures to survive



### POIKILOTHERMS



This property protects marine organisms from rapid changes in temperature. especially cold-blooded creatures

#### Cold-blooded organisms

such as most vertebrates such as fish, amphibians, and reptiles, and all invertebrates such as arthropods and mollusks, depend on external sources, such as sunlight or warm environments, to regulate their body temperature, which changes with the surrounded temperature.

whose body temperature depends on the temperature of the surrounding environment.

For this reason, we often find these organisms in the deep seas and oceans where the temperature is stable.

**Warm-blooded animals**, such as birds and mammals, can maintain a constant temperature inside their bodies through metabolic processes regardless of the temperature of the surrounding environment.





## Lesson (4) Aqueous solutions and their properties

\* Water in natural bodies like lakes and oceans is not pure water, but it is mixed with several substances that are dissolved or suspended in it.

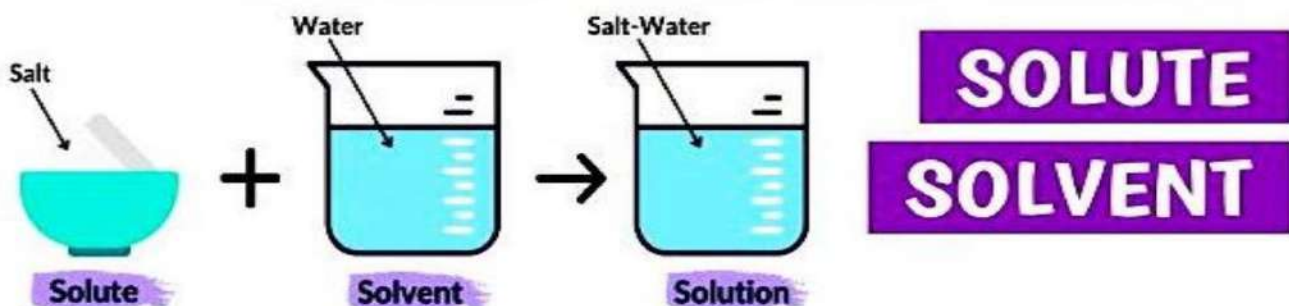
**\*The dissolved substances directly affect :**

- 1- Properties of water.
- 2- The change in water currents.
- 3- Distribution of marine organisms.



**Solution:** is a homogeneous mixture of a solvent and a solute.

# SOLUTION

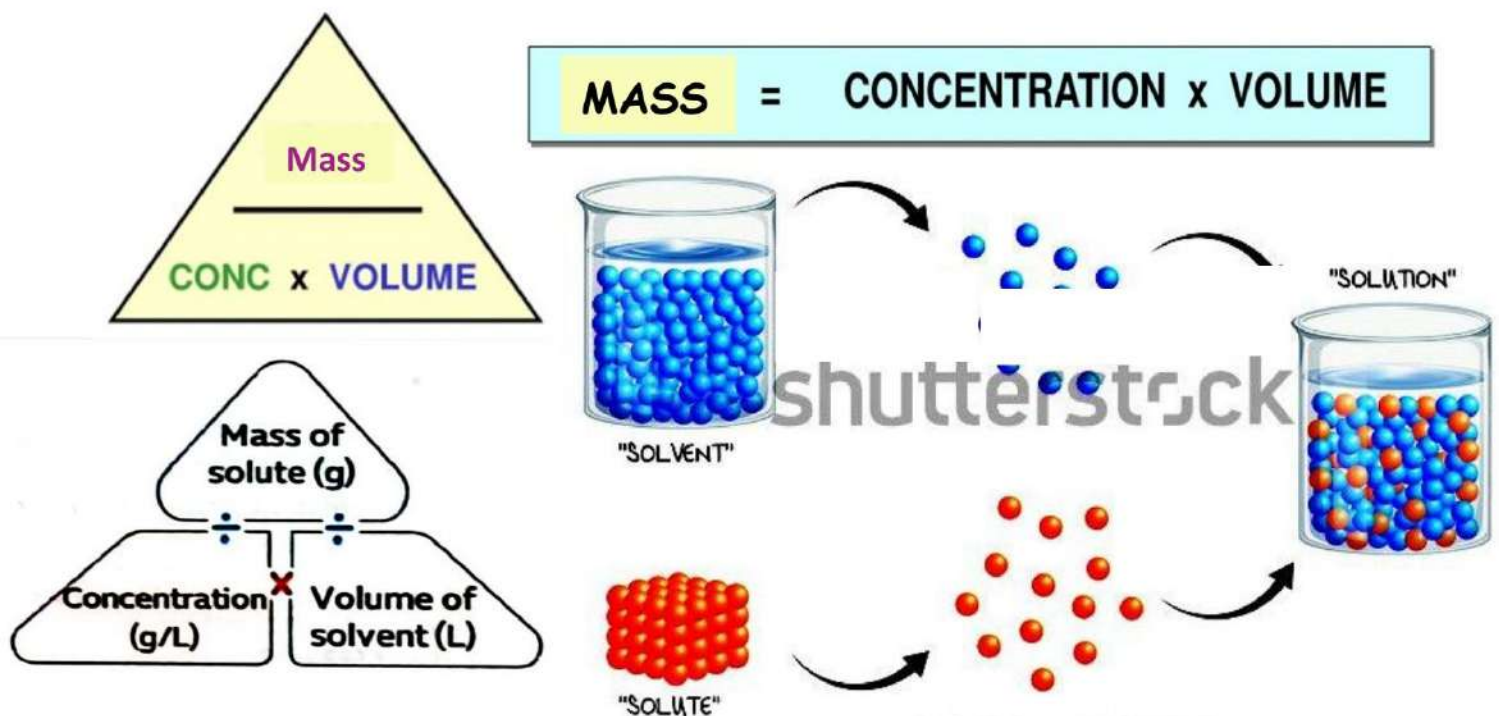


**In an aqueous environment:**

**\*Solvent:** in which the other substances (solute) dissolve (it is usually water).  
It exists in greater amount.

**\*Solute:** the dissolved substance as salts or other substances.  
It exists in smaller amount.

**Concentration:** is the amount of solute in a given volume of a solvent.

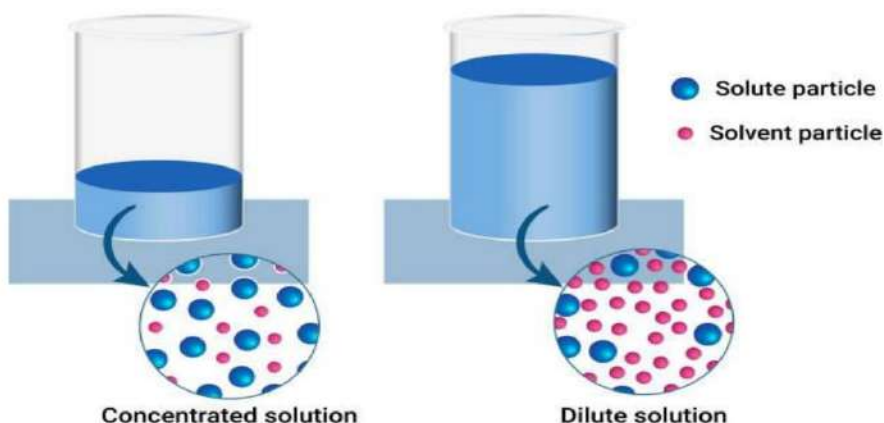




## Factors affecting concentration:

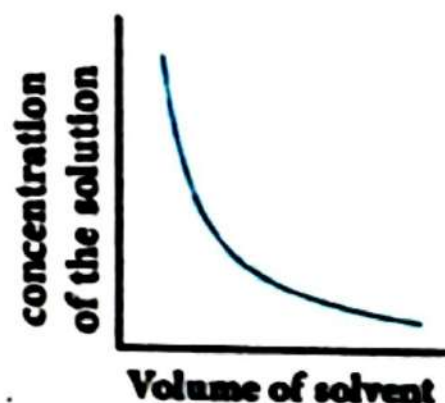
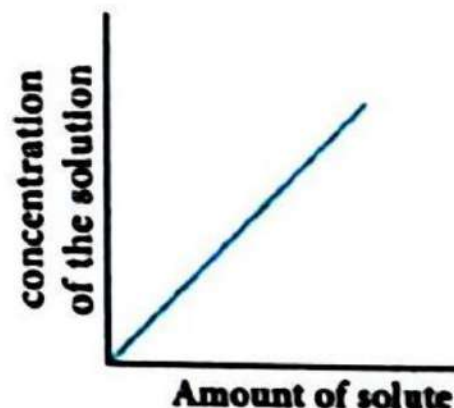
**1- Amount of solute:** increasing the amount of solute increases the concentration of solution (direct relation).

Concentrated solution vs Dilute solution

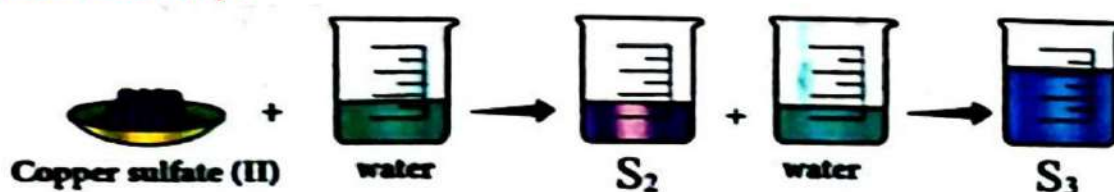


More solute = higher concentration

Less solute = lower concentration



**2- Volume of solvent:** increasing the volume of solvent decreases the concentration of solution (inverse relation).



The concentration of solution  $S_2$  is greater than that of solution  $S_3$ .

### 1-The colligative properties of water



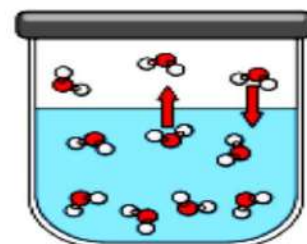
They are properties of a solution that depend on the number of solute particles (molecules or ions) of non-volatile solute in the solution and not on the type of solute.

#### Colligative properties include:

- 1- Lower of vapor pressure.
- 2- Higher of boiling point,
- 3- Lower of freezing point.
- 4- Osmotic pressure

**First: Lower of vapor pressure of the liquid**

#### Vapour pressure:



It is the liquid vapour pressure on liquid surface in closed container, when the liquid and its vapour are in dynamic equilibrium at constant temperature and pressure



## Dynamic equilibrium:

It is the an equilibrium between the evaporation rate of the liquid and condensation rate of its vapour at constant temperature and pressure in closed container.

\*In the closed flask (system) the particles of the liquid at certain temperature:

\*Some particles liberate from its surface as vapor particles.

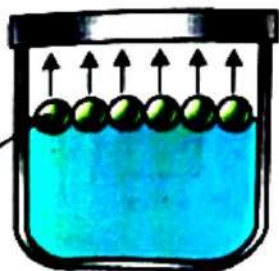
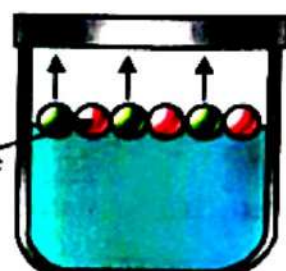
\*Some vapour particles return back to the liquid

\*When the rates of evaporation of the liquid = the rate of condensation of the vapour that leads to the amount of the liquid and the vapour is constant, So **the liquid and its**

**vapour are in dynamic equilibrium.**

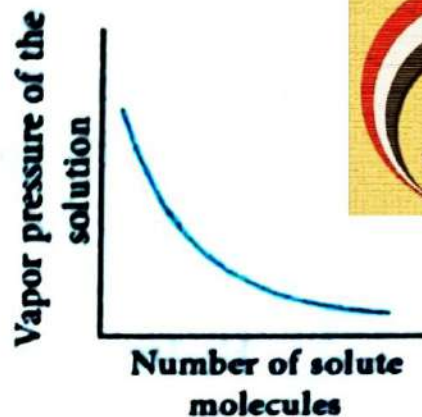
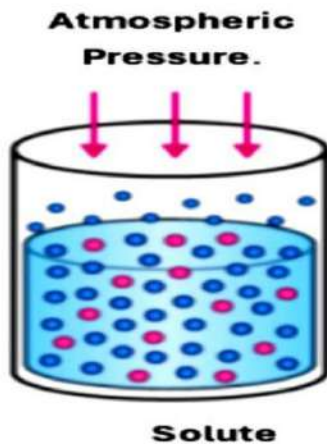
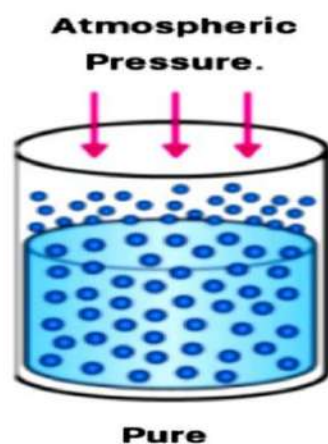
The liquid vapour formed above the surface of the liquid from evaporation exerts a pressure on the surface of the liquid called the **vapour pressure of the liquid.**

### Vapour pressure in pure water and in solutions

|                                        | Vapor Pressure of Pure Water                                                                                                                                      | Vapor Pressure of Solutions                                                                                                                                                                                                                                                          |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Pressure value</b>                  | Higher                                                                                                                                                            | Lower                                                                                                                                                                                                                                                                                |
| <b>Surface molecules of the liquid</b> | Only water molecules are present                                                                                                                                  | Water molecules are interspersed with some solute particles                                                                                                                                                                                                                          |
| <b>Explanation</b>                     | <p>All surface molecules are water, allowing more molecules to evaporate.</p>  | <p>1- Solute molecules occupy part of the surface, reducing water molecules available for evaporation.<br/>2- Attractive forces between solute and water require more energy to overcome.<br/>Both factors lower the number of evaporating molecules, decreasing vapor pressure.</p> |
| <b>Illustrative figure</b>             |  <p>Solvent</p>                                                                |  <p>Solute</p>                                                                                                                                                                                  |

-The decrease in the liquid vapor pressure of a solution is directly proportional to the number of solute molecules or ions in the solution.





The liquid vapour pressure **decreases** when dissolving a substance (solute).

## Second: Higher of boiling point:

### Boiling point of a liquid:

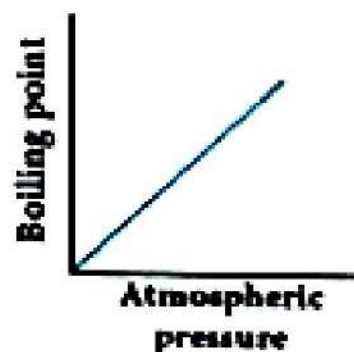
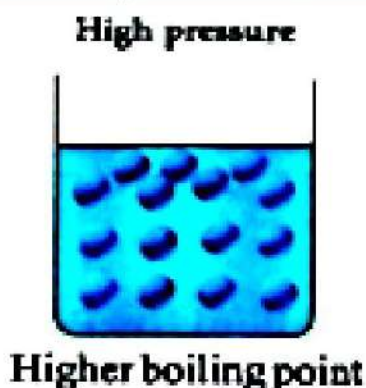
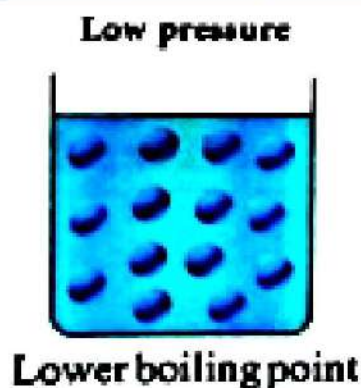
It is the temperature at which vapour pressure of liquid = the atmospheric pressure acting on the liquid surface.

At normal atmospheric pressure, the boiling point of pure liquid is constant, So The boiling point can be used as an indicator of the purity of liquids.

### Factors affecting the boiling point

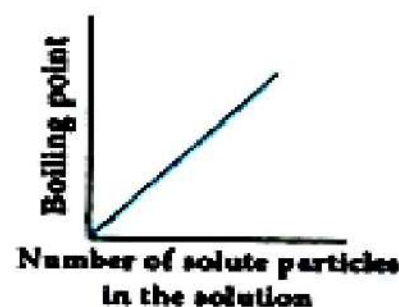
#### 1-External pressure:

\*The boiling point of a liquid varies if the atmospheric pressure at the surface of the liquid increases and decreases as the atmospheric pressure **(direct relation)**



#### 2- The concentration of solute within liquid:

The boiling of solution increase with the number of solute particles (molecules or ions) present.



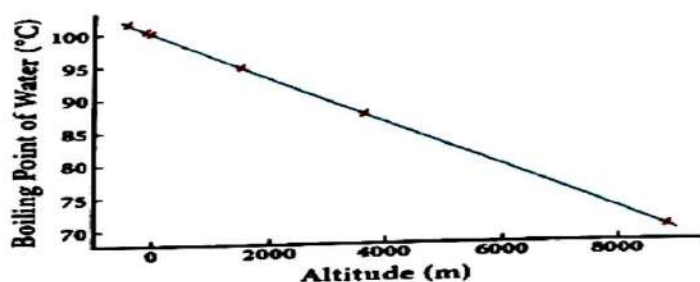


The higher the concentration of the solution the higher its boiling point and vice versa (direct relation).

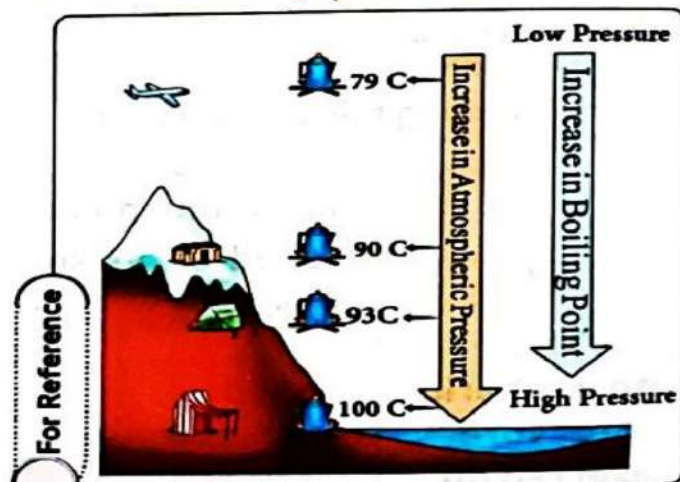
**Life applications:**

**Boiling point at High altitudes:**

When ascending to the top of the mountain, the atmospheric pressure **decrease**, causing the **reduction** in the boiling point of water below  $100^{\circ}\text{C}$ .



Decrease of water boiling point as altitude increases



### 3-Dissolving a substance in water

When dissolving of a non-volatile substance in water to form a solution, the vapour pressure **decreases** (less than pure water).

The boiling point of a solution is higher than the boiling point of pure water at normal atmospheric pressure

Due to the bonding forces between the solute and solvent molecules and ions, which increase the energy required to vaporize the liquid.

The increase in the boiling point of a solution is directly proportional to the number of molecules or ions dissolved in the solution.

#### **Factors affecting boiling point**

- 1- The pressure acting on its surface. (directly)
- 2- The number of molecules or ions dissolved in the solution. (directly)
- 3- Height from the earth. (inversely)





### Third: Lower of freezing point:

The **freezing point** of the solution is always lower than the freezing point of pure water under normal atmospheric pressure.

Due to the attraction forces between water molecules and solute molecules opposes the freezing process as it prevent the attachment of water molecules together and prevent the conversion of liquid water into ice crystals.

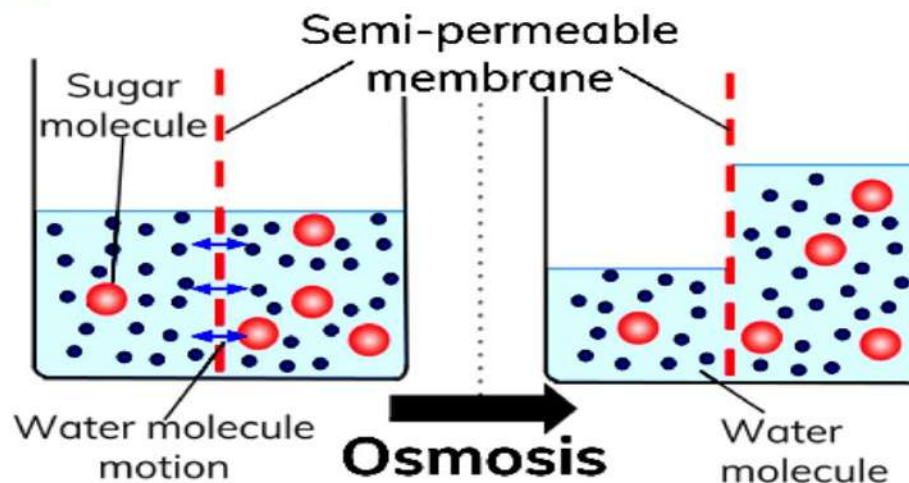
### Life application:

Salt is sprinkled on roads in cold areas after rainfall.

So that the rainwater turns into a salt solution, and its freezing point is lower than the freezing point of water. So the amount of ice formed on the road's decreases, which reduces the chances of accidents on the road.

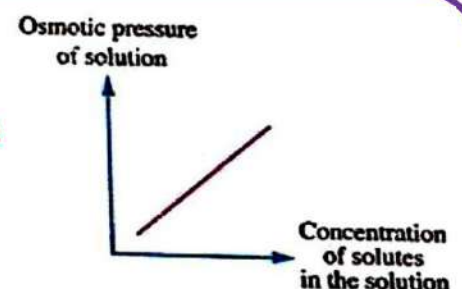
### Fourth: Osmosis and osmotic pressure:

**Osmosis** is the phenomenon of water transfer from a dilute solution to a concentrated solution through a semi-permeable membrane separating the two solutions.



### Osmotic pressure

It is the pressure created in a solution **due to the difference in solute concentration in the solution** and leads to the diffusion of water from the less concentrated solution (low osmotic pressure) towards the concentrated solution (higher osmotic pressure).





## Lesson (5)

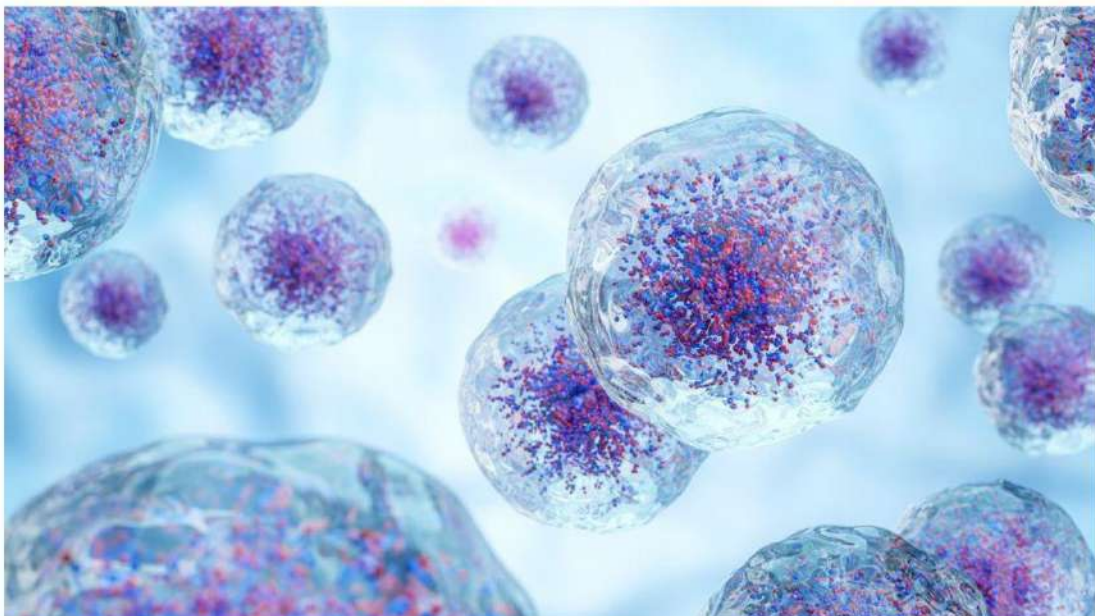


### Biological importance of water

*Water is essential for life, because the organisms cells consist of organic molecules, inorganic molecules, the most important is water, mineral salts.*

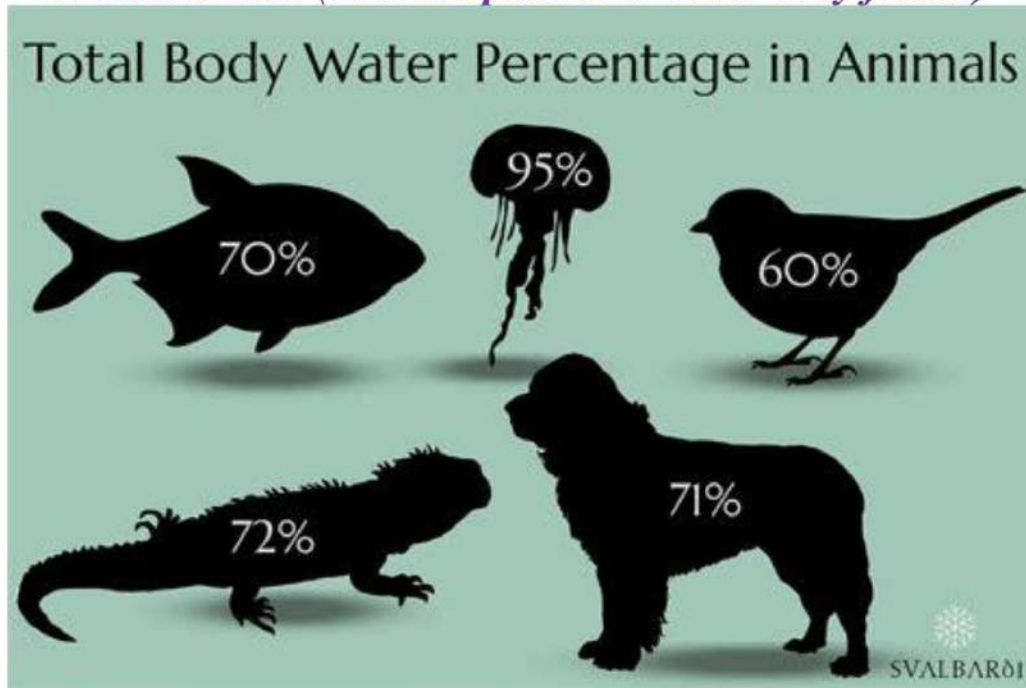


1. Water is the **most abundant chemical substance** in organisms.
2. Water is **present in almost all chemical reactions** in vital activities.
3. Water is found both **inside and outside the cells**.





4. In **mammals**, water make about **70% of the body mass**, **47% is inside cells**, **23% is outside cells** (in blood plasma or other body fluids.)

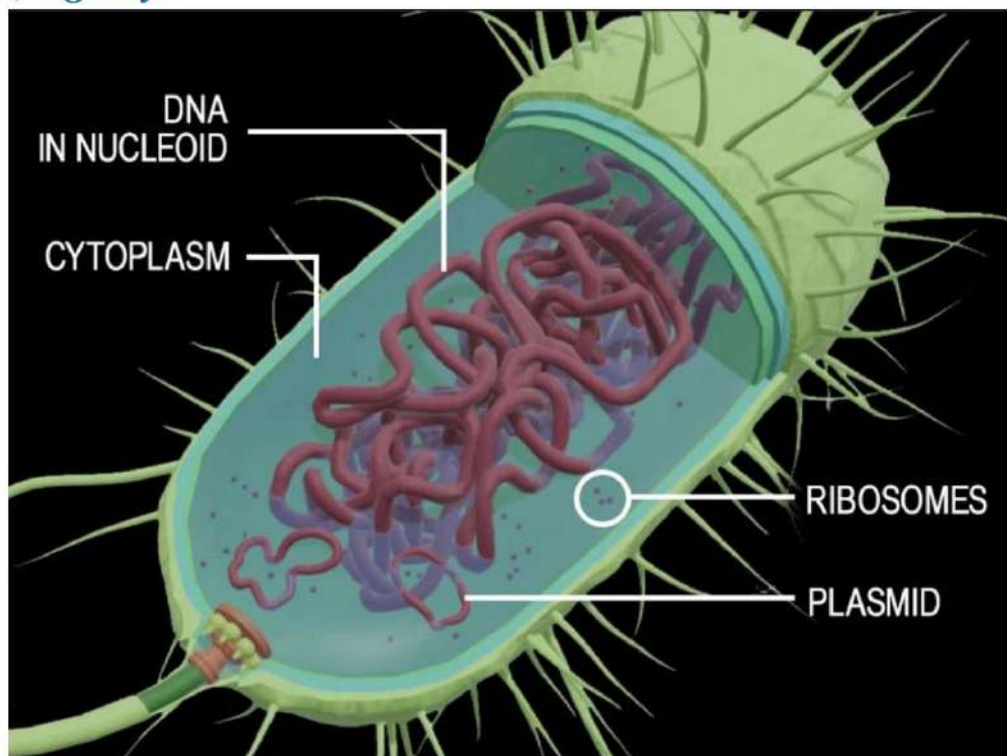


### water in living cells

- Cell is the **basic unit** of life (**structural ,functional unit of all organisms**).
- Most cells have a nucleus containing genetic material.

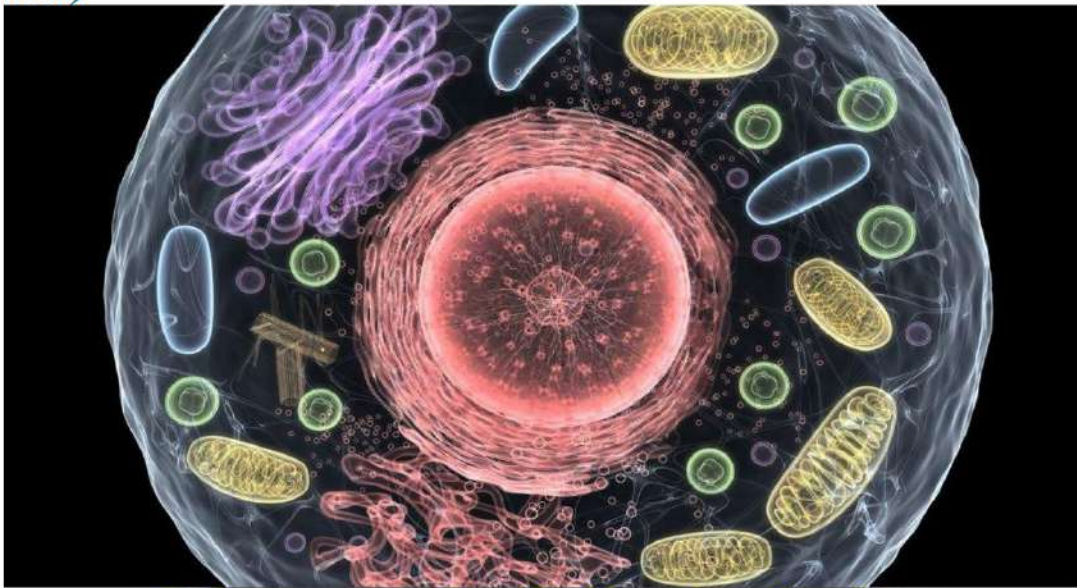
### Organisms are classified into

A. **Prokaryotes** genetic material is not surrounded by a nuclear membrane (unicellular) like bacteria have cell wall containing peptidoglycan that gives them shape , rigidity.



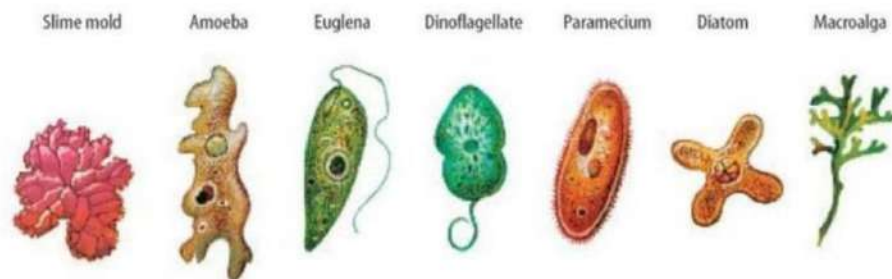


**B. Eukaryotes** *genetic material is enclosed by a nuclear membrane*  
*(contains nucleus surrounded by membrane ,organelles like mitochondria ,plastids)*



**Eukaryotes are classified into four kingdoms**

**1) Protists** *(mostly unicellular) or (simple multicellular), often aquatic, can be autotrophic (golden algae) or heterotrophic (protozoa).*



**Kingdom: PROTISTA**

Remember, protists are

**EUKARYOTIC**

**UNICELLULAR**

**2) Fungi** *(mostly multicellular) (except yeast), heterotrophic have cell walls made of chitin*





3) *Plants (multicellular), autotrophic, having cell walls made of cellulose, and perform photosynthesis to produce food.*



4) *Animals (multicellular), heterotrophic, have no cell walls, capable to move have complex body systems to survive.*





## *Animals are classified into*

### *1-invertebrates*

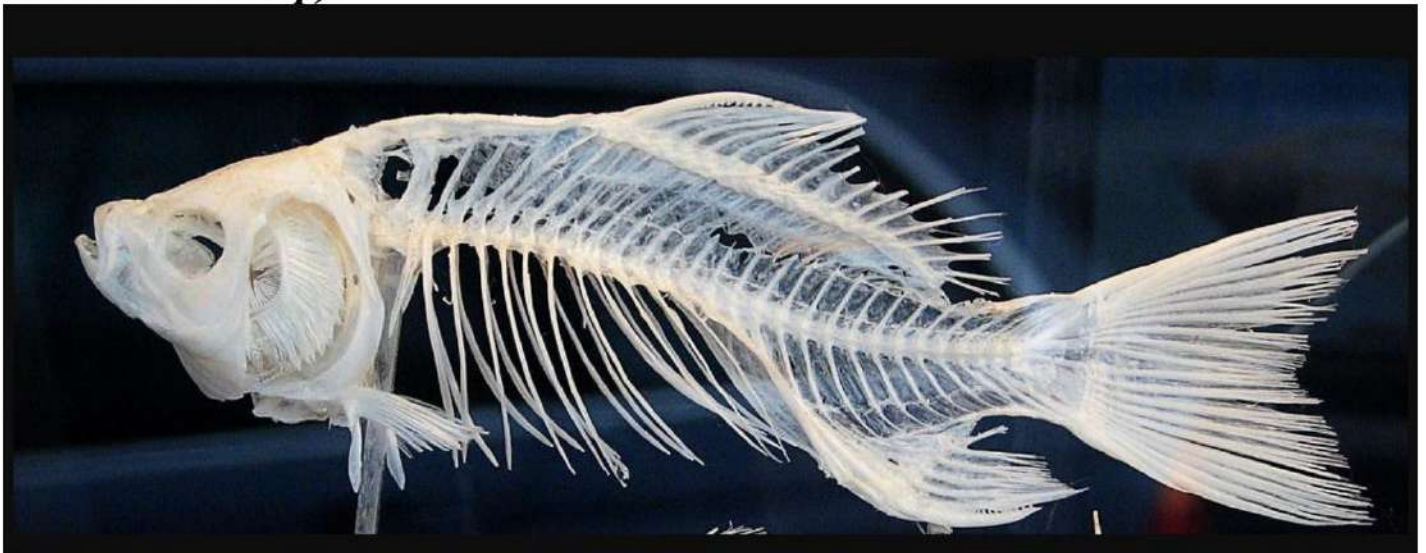
### *2-vertebrates*

**1) Invertebrates have no backbone**, (sponges, coelenterates (like jellyfish), worms, arthropods (like insects), mollusks (like clams), echinoderms (like starfish).

### Examples of Invertebrates



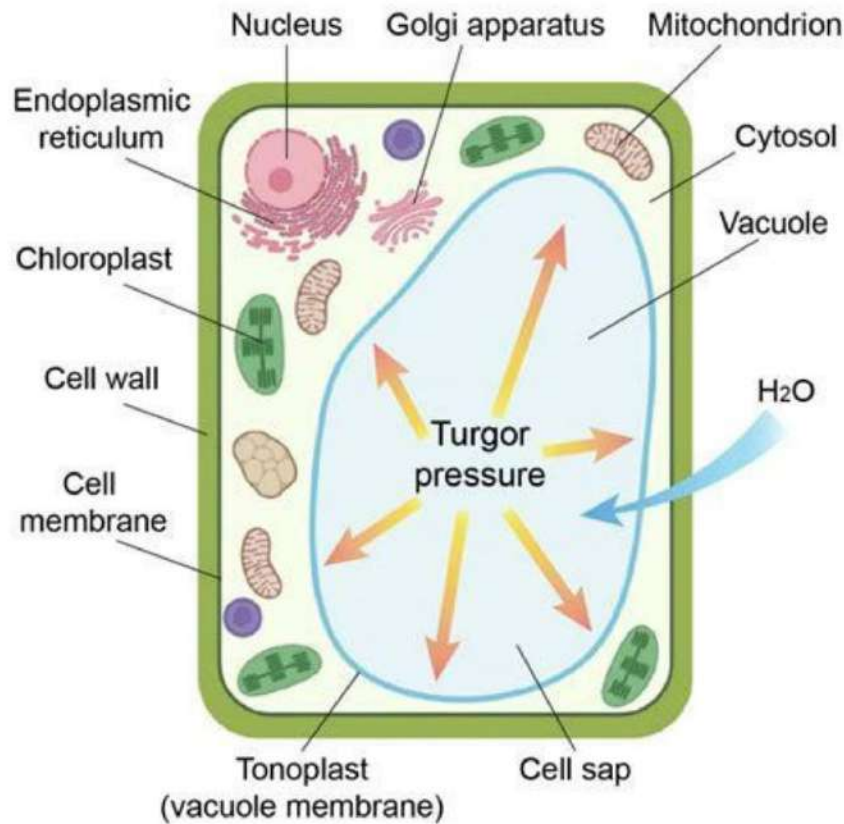
**2) Vertebrates have backbone**, (fish, amphibians, reptiles, birds, mammals, humans at the top).





### A. Cell wall

*thick wall made of cellulose surrounds the cell, gives its shape, encloses its components, protects it, permeable to water and salts, found in plant, fungal cells.*



### B. Cell membrane (Plasma Membrane):

*thin semi-permeable membrane surrounds the cell in all organisms. It separates the cell components from the surrounding protecting them, regulates the passage of materials into and out of the cell.*

### C. Cytoplasm

*gel-like substance mostly of water, containing important chemicals for survival.*

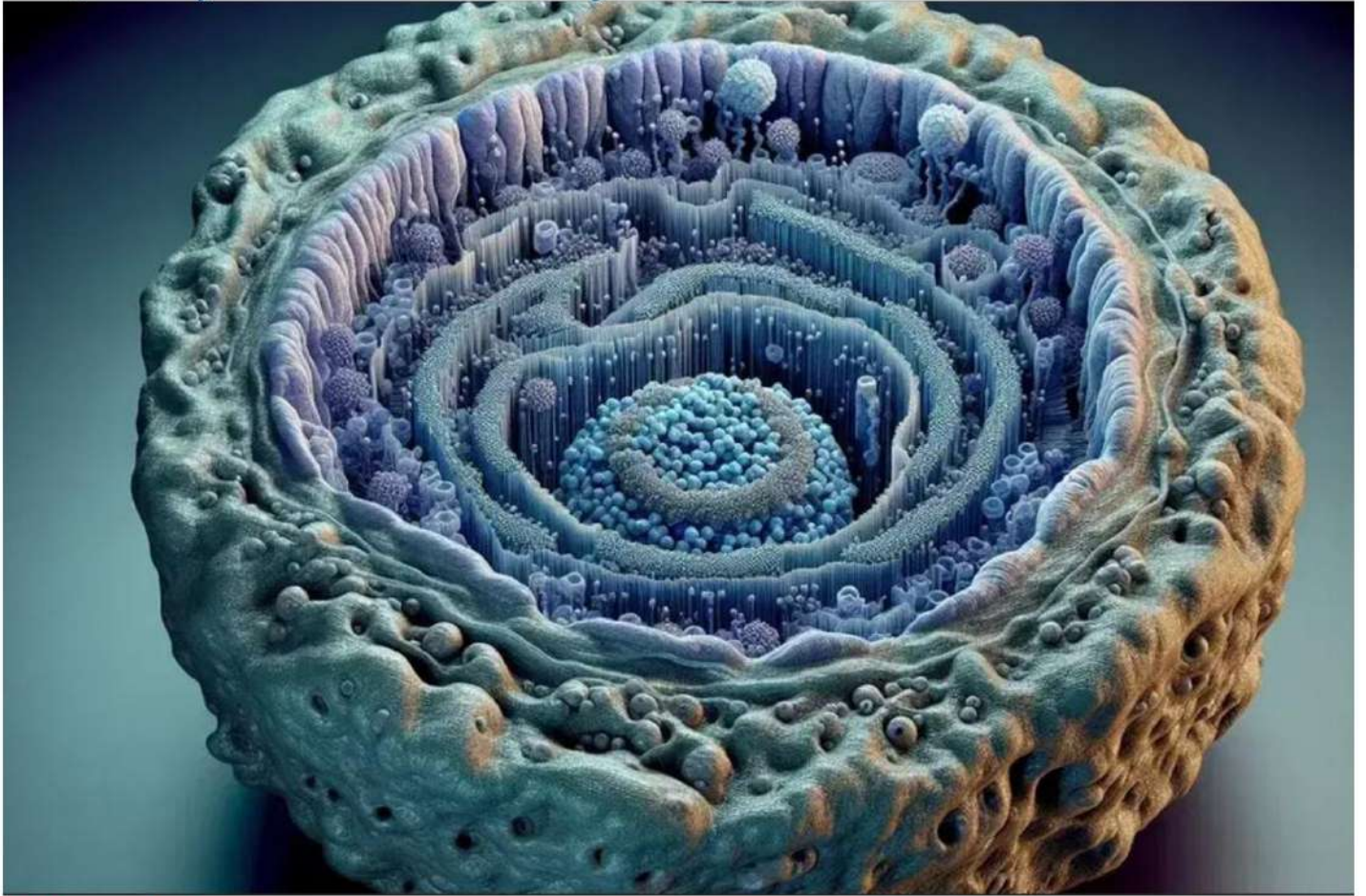




**D. Nucleus :**

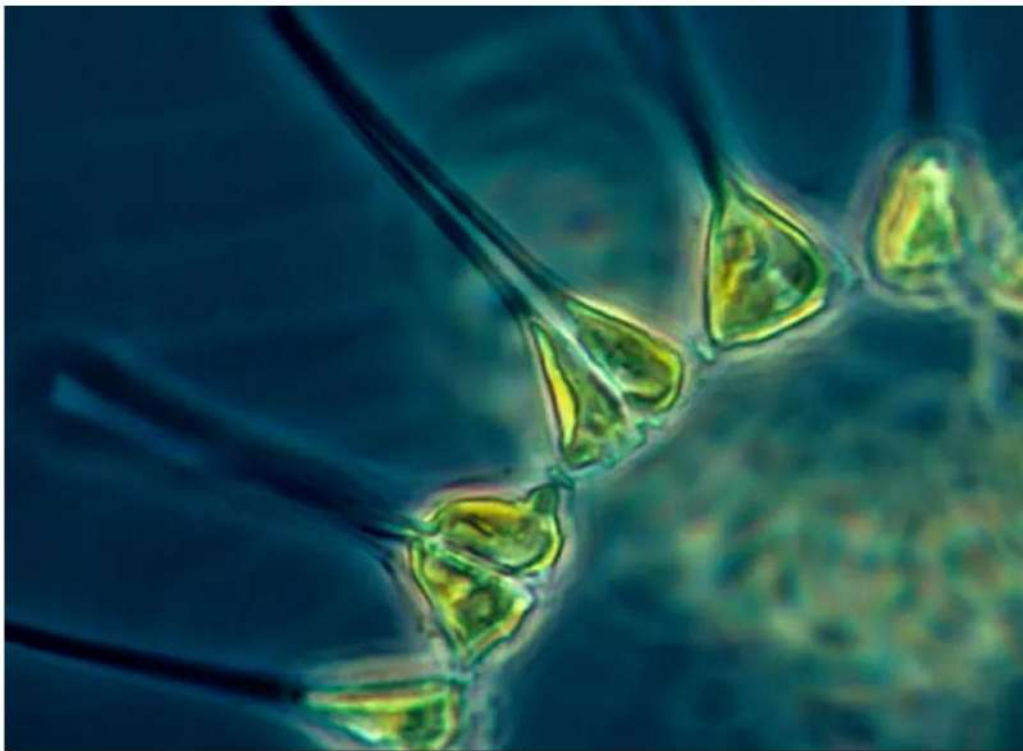
*It's inside the cell, controls the cell's activities.*

*contains the genetic material that determines the traits found in plant ,animal cells, usually located at the center of the animal cell.*



**E. Chloroplasts**

*found only in plant cells, contain chlorophyll*





### F. Vacuoles

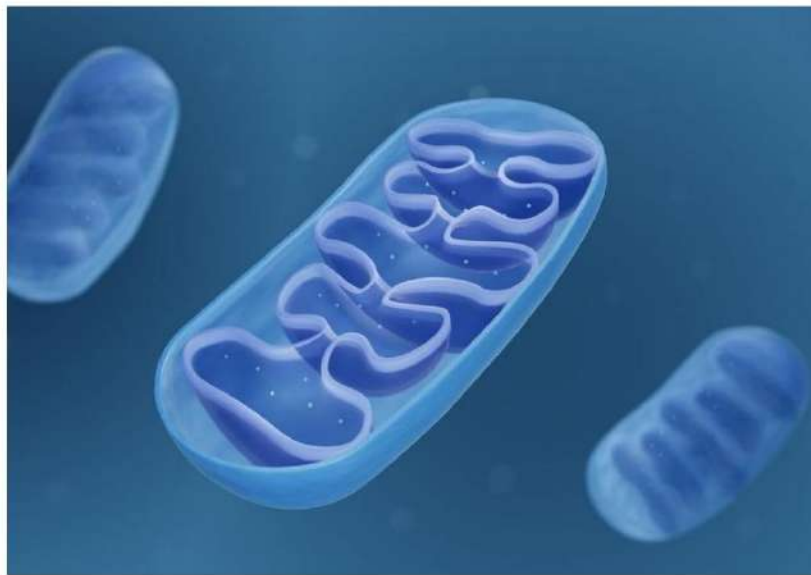
*store food, water, excess salts.*

- a) *In plant cell They are few, large located at the center*
- b) *in animal cells they are numerous ,small-sized*



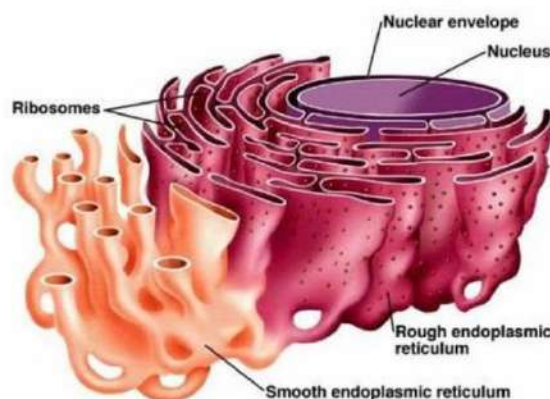
### G. Mitochondria

*energy-production centers in the cell.*



### H. Endoplasmic reticulum

*group of membranes transport materials from one place to another inside the cell.*





## Importance of Water to Organisms

- 1- *Water is a universal solvent, allow the biochemical reactions to occur by dissolving mineral salts ,nutrients ,carrying gases ( oxygen ,carbon dioxide) to facilitate their transport inside the organism ,getting rid of wastes out of it.*
- 2- *The cytoplasm is mainly water , Cytoplasm maintains the cell shape forming and creating internal pressure that resists the pressure surrounding the cell.*
- 3- *the high specific heat of water, helps the organisms to maintain stable internal temperatures despite its fluctuations outside.*
- 4- *essential in maintaining internal balance and supporting the chemical activities ,as it participates in metabolism.*

## Water and Metabolism

*Metabolism is divided into*

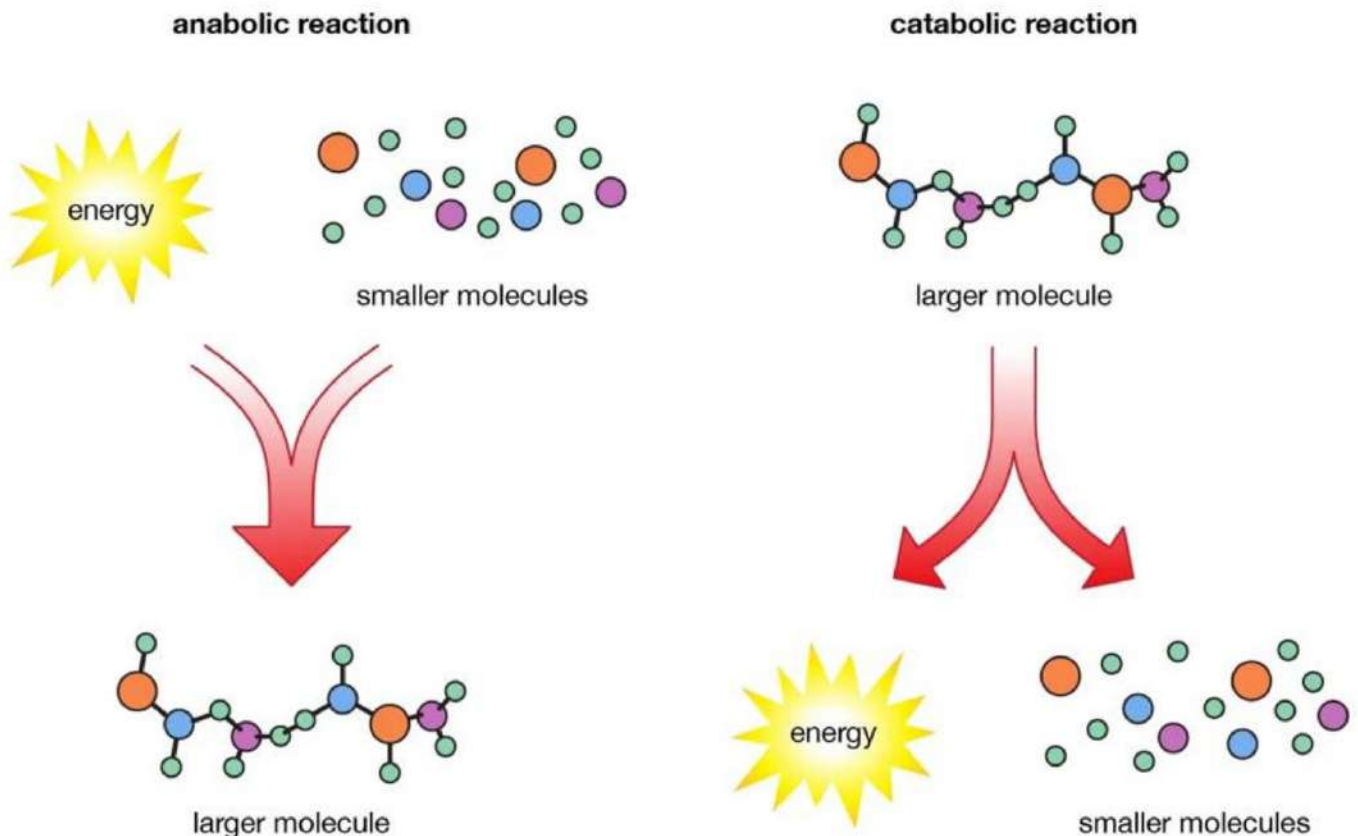
1. *catabolic processes.*
2. *anabolic processes.*

*1-catabolic processes, chemical bonds between the atoms of complex molecules are broken to release the energy stored in them.*

*(breakdown of glucose sugar during cellular respiration into  $\text{CO}_2$  , water)*

*2-anabolic processes, it consume energy to make large ,complex molecules of simple molecules. ( photosynthesis ,the synthesis of proteins from amino acids)*

### Metabolism

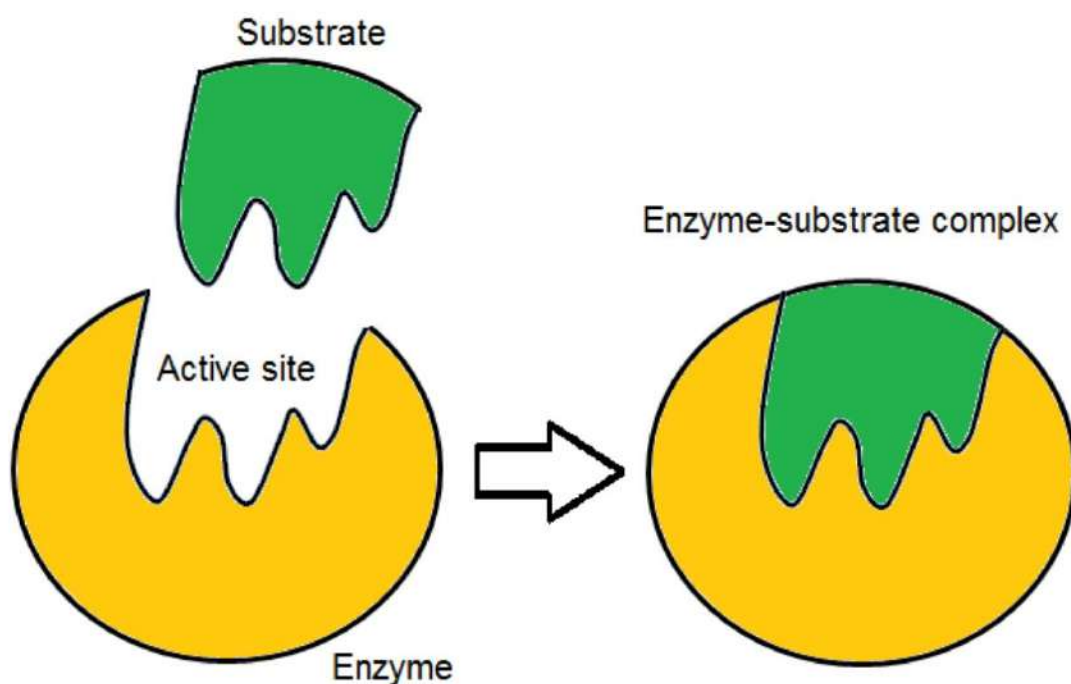




- ★ *metabolism require high activation energy to initiate (start) the reaction.*
- ★ *Activation energy the minimum energy needed to start a reaction.*
- ★ *catalysts or activators substances (enzymes) lower the activation energy of reactions*

### **Rate of enzymatic activity**

- 1) *Enzymes are specialized protein that increase the speed of reactions in cells.*
- 2) *Enzymes work through a mechanism called lock and key,"*
- 3) *the active site of the enzyme binds specifically to the substance it affects (the substrate), that help the reactants convert into products more efficiently.*
- 4) *At the end of reaction, the enzyme remains unchanged, ready to catalyze another reaction of the same type.*



- 5) *Each enzyme has an ideal temperature ,pH value that is most effective at it.*
- 6) *If the temperature or pH value deviates higher or lower than its optimal range, the enzyme's activity decreases until it stops completely.*





حمل الآن

مجاناً وحصرياً

# المراجعة رقم (4)

اختبار شهر اكتوبر





1<sup>st</sup> Secondary

Integrated Sciences

الفصل الدراسي الأول

الدرس - الأول -

The Hydrosphere of Planet Earth

- الإختبار -



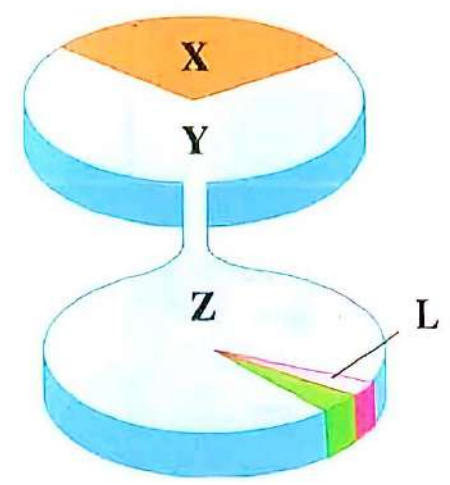
I - Choose the correct answer :

1. What are the states of matter at which water exists in the spheres of planet Earth?.....
- a. O Solid and liquid

b. O Solid and gaseous

c. O Solid, liquid and gaseous

d. O Liquid and gaseous
2. The opposite figure shows the distribution of water on the Earth's surface.



Which of the following choices in the table is correct?.....

|      | X           | Y     | Z           | L           |
|------|-------------|-------|-------------|-------------|
| a. O | Land        | Ice   | Fresh water | Saltwater   |
| b. O | Land        | Ice   | Saltwater   | Fresh water |
| c. O | Fresh water | Ice   | Saltwater   | Land        |
| d. O | Land        | Water | Saltwater   | Fresh water |

3. In which physical states does water appear as part of the components of the atmosphere?.....
- a. O Liquid only

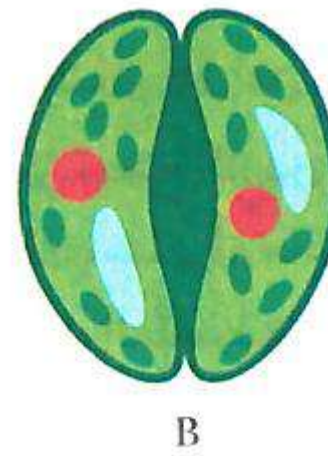
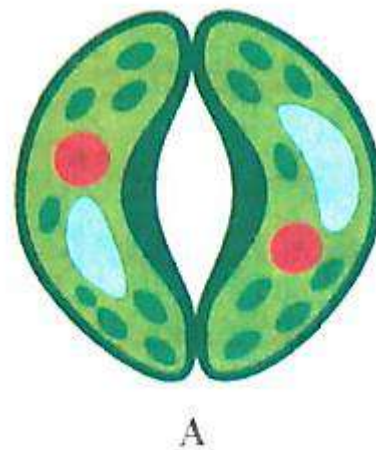
b. O Solid and liquid

c. O Liquid and gaseous

d. O Gaseous only



4. Which of the following processes doesn't lead to increasing the percentage of water vapor in the atmosphere?..
- a. ☐ Transpiration in plants
  - b. ☐ Water infiltration through sedimentary rocks
  - c. ☐ Animals respiration
  - d. ☐ Seawater evaporation
5. Which of the following processes is opposite to the condensation process in the water cycle in nature?....
- a. ☐ Water infiltration (leakage) through the soil pores
  - b. ☐ Evaporation from water surfaces
  - c. ☐ Rain falling
  - d. ☐ Ice melting
6. What is the direct role of transpiration process in the hydrologic cycle?.....
- a. ☐ Water leakage through sedimentary rocks
  - b. ☐ Condensation of water vapor forming clouds
  - c. ☐ Increasing CO<sub>2</sub> gas percentage in the atmosphere
  - d. ☐ Increasing the water vapor in the atmosphere
7. The two processes in which the physical state of water is the same after their occurrence directly are...
- a. ☐ evaporation and condensation
  - b. ☐ transpiration and evaporation
  - c. ☐ condensation and transpiration
  - d. ☐ condensation and freezing
8. Study the opposite figure, which shows two cases of microscopic stomata. Identify:  
Which of the two cases causes the ascending of water and salts from the roots to the upper parts of the plant?..



- a. ☐ (A) only
- b. ☐ (B) only
- c. ☐ (A) and (B)
- d. ☐ None of them



1<sup>st</sup> Secondary

## Integrated Sciences

الفصل الدراسي الأول

الدرس - الثاني -

The Chemical Properties of water

- الإختبار -

**First : Choose the correct answer :**

1. Which of them expresses the unique properties of water?.....

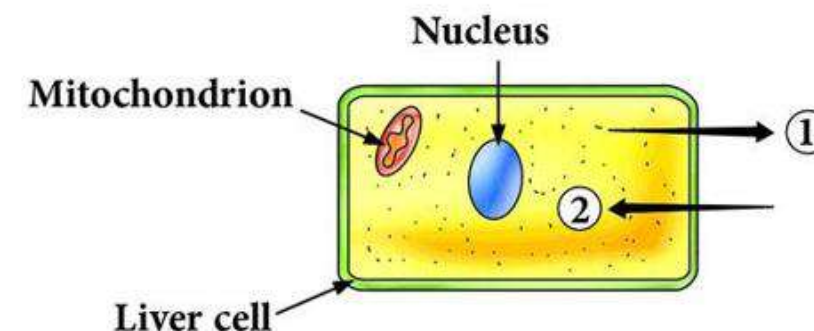
- a. Water has the ability to dissolve many chemical substances
- b. Water always exists in liquid form at the known temperatures on the Earth's surface
- c. Water passes through the plasma membrane of all cell of living organisms

- a. O (a) and (c)
- b. O (a) and (b)
- c. O (a), (b) and (c)
- d. O (b) and (c)

2. The opposite diagram represents the structure of a living cell. Study it well, then answer

What is the main purpose of the passage of water in direction (2)?.....

- a. O Transport of nutrients and oxygen
- b. O Removal of wastes
- c. O Regulation of temperature
- d. O Transport of carbon dioxide gas



3. In the opposite water molecule :

(Given that the atomic mass of H = 1, O = 16)



The mass percentage of hydrogen is.....%

- a. O  $\frac{100}{3}$
- b. O  $\frac{200}{3}$
- c. O  $\frac{100}{9}$
- d. O  $\frac{200}{9}$



4. A pure sample of water contains 0.37 g of hydrogen. The total mass of the sample equals

- a. O 3.33 g                      b. O 2.96 g                      c. O 8.89 g                      d. O 1.1 g

5. To form 54 gm of water, it is required to react to 48 gm of oxygen with 6 gm of hydrogen.

So, 2 gm of hydrogen combines completely with.....gm of oxygen

- a. O 12                      b. O 16                      c. O 96                      d. O 144

6. A sample of water contains oxygen with a mass percentage of 90%. This sample is.....

- a. O Pure, with hydrogen mass percentage of 10%                      c. O Impure, containing non—exogenous impurities  
b. O Impure, containing exogenous impurities                      d. O Pure, with hydrogen mass percentage of 11.11 %

7. Which of the following isn't from the properties of water that support the life?.....

- a. O Dissolving many chemical compounds                      c. O Passing required substances to inside the cell  
b. O The difference in the mass of its elements                      d. O Passing the wastes to outside the cell

8. A covalent bond is a type of.....bonds in which two atoms share a(an).....number of electrons.

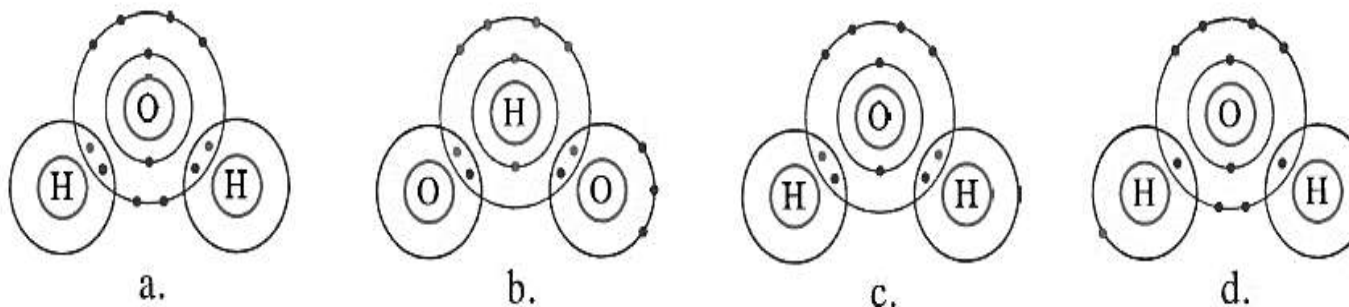
Which of the following is correct?

- a. O Chemical – equal                      c. O Physical – equal  
b. O Chemical – unequal                      d. O Physical – unequal

9. How many covalent bonds are present inside three water molecules?.....

- a. O 3bonds                      b. O 9bonds                      c. O 6 bonds                      d. O 12 bonds

10. Which of the following figures represents the water molecule? Fig.....



11. **What is the reason of forming hydrogen bonds among water molecules?.....**

- a. O Volume of (O) atom > Volume of (H) atom
- b. O Mass of (O) atom > Mass of (H) atom
- c. O Density of (O) atom > Density of (H) atom
- d. O Electronegativity of (O) atom > Electronegativity of (H) atom

12. **A pure water sample contains.....bonds**

- a. O Polar covalent bonds causing low boiling point
- b. O Polar covalent bonds with bond angles >  $90^\circ$
- c. O Hydrogen bonds causing low boiling point
- d. O Hydrogen bonds reducing cohesion

13. **The diagram shows the structure of a water molecule**

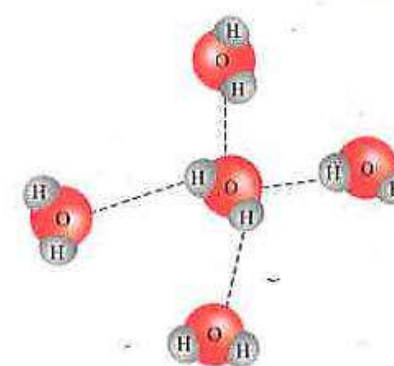
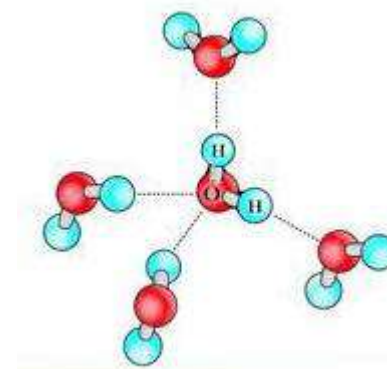
**The angles between bonds in water molecule equals.....**

- a. O  $104.5^\circ$
- b. O  $120^\circ$
- c. O  $105.4^\circ$
- d. O  $100^\circ$

14. **The opposite figure represents a number of water molecules.**

**What is the number of hydrogen and covalent bonds respectively?.....**

- a. O 4/10
- b. O 5/4
- c. O 4/5
- d. O 10/4



15. **How many hydrogen atoms enter in the formation of 6 hydrogen bonds among a number of water molecules?.**

- a. O 6
- b. O 12
- c. O 18
- d. O 24



16. All of the following are results of the polarity of the water molecule, except.....

- a. ☐ The bonding of water molecules together by hydrogen bonds
- b. ☐ The ability to dissolve many mineral salts
- c. ☐ The boiling point of water rises to 100 °C
- d. ☐ The ability to dissolve a non-polar organic compound

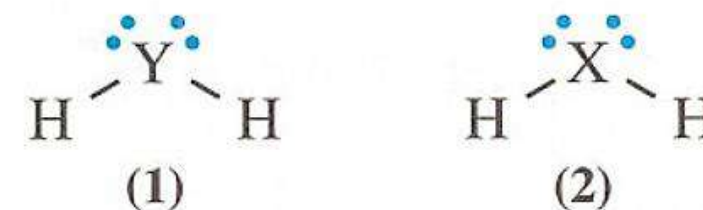
17. Which of the following explains why water has a higher boiling point compared to hydrogen sulphide (H<sub>2</sub>S), despite the similarity in their molecular structures?....

- a. ☐ Covalent bonds in water are weaker than that in H<sub>2</sub>S
- b. ☐ Water Hydrogen bonds are stronger than that in H<sub>2</sub>S
- c. ☐ Water is non-polar while H<sub>2</sub>S is polar
- d. ☐ Oxygen is more electronegative than sulphur

18. The following figure shows the molecular structure of two compounds, as hydrogen bonds are found among the molecules of compound (1), while being absent among the molecules of compound (2) despite of their similar structures.

What is the reason for that?.....

- a. ☐ The difference in the electronegativity between atoms (X) and (H) is higher
- b. ☐ The difference in the electronegativity between atoms (Y) and (H) is higher
- c. ☐ Molecule (1) is non-polar, while molecule (2) is polar
- d. ☐ The electronegativity of atom (X) is higher than that of atom (Y)



19. Which of the following explains the ability of water to dissolve most salts and break them into hydrated ions?

- a. ☐ Presence of ionic bonds
- b. ☐ Presence of covalent bonds
- c. ☐ Water polarity
- d. ☐ Small bond angles

1<sup>st</sup> Secondary

Integrated Sciences

الفصل الدراسي الأول

الدرس - الثالث -

The Physical Properties of Water

- الإختبار -



**First : Choose the correct answer :**

1. One of the units of density measurement is.....

- a.  $\text{O N.m}^{-3}$                       b.  $\text{O g.mm}^{-1}$                       c.  $\text{O Kg.cm}^{-1}$                       d.  $\text{O g.L}^{-1}$

2. The density of 12 gm of pure iron is.....the density of 2 gm of it

- a.  $\text{O more than}$                       b.  $\text{O less than}$                       c.  $\text{O equal to}$                       d.  $\text{O double}$

3. The mass of a piece of rock whose density is  $2.8 \text{ gm/cm}^3$  is 28 gm so, the density of 280 gm of it is..... $\text{gm/cm}^3$

- a.  $\text{O 280}$                       b.  $\text{O 28}$                       c.  $\text{O 2.8}$                       d.  $\text{O 28.5}$

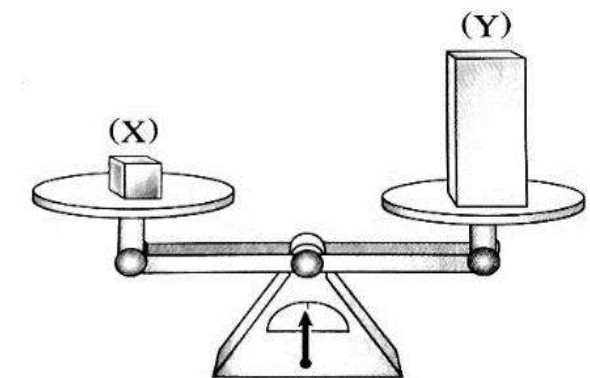
4. Two objects (A) and (B) are equal in mass, if the density of the substance of object (A) is doubled the density of the substance of object (B), so the ratio between the volume of object (A) to the volume of object (B) is...

- a.  $\text{O 1 : 1}$                       b.  $\text{O 1 : 2}$                       c.  $\text{O 2 : 1}$                       d.  $\text{O 2 : 2}$

5. In the opposite figure :

The two objects (X) and (Y) have the same.....

- a.  $\text{O volume and density}$   
b.  $\text{O mass and volume}$   
c.  $\text{O mass and density}$   
d.  $\text{O mass and they are from different substances}$



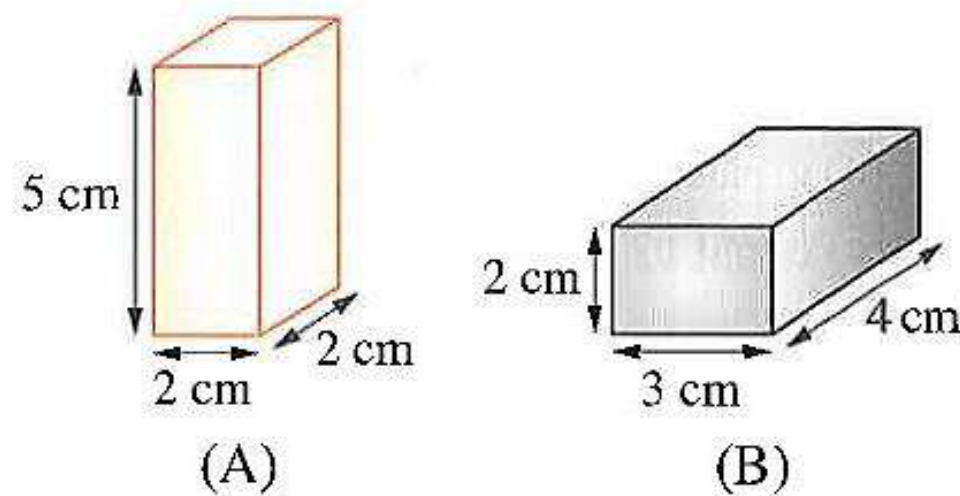
6. A flask containing a sample of seawater was placed on the pan of a balance.

The reading of the balance for the water and the flask together was 100 g, as shown in the figure. Knowing that the density of seawater is  $1030 \text{ kg/m}^3$ , what do you expect the volume of the sample to be?....

- a.  $\text{O Greater than 97 cm}$                       c.  $\text{O Equal to 97 cm}$   
b.  $\text{O Less than 97 cm}$                       d.  $\text{O Cannot be determined}$



7. The opposite figure shows the dimensions of two solid bodies, A and B, having the same mass, so which body is made of the material of the higher density?.....



- a. ☐ Body A  
b. ☐ Body B  
c. ☐ Both bodies have the same material density  
d. ☐ The answer cannot be determined
5. The mass of water in gm is always.....its volume is  $\text{cm}^3$  (knowing that the density of water is  $1 \text{ gm}/\text{cm}^3$ )  
a. ☐ double  
b. ☐ less than  
c. ☐ more than  
d. ☐ equal to
8. The mass of a piece of ice before melting is.....its mass after melting  
a. ☐ more than  
b. ☐ less than  
c. ☐ equal to  
d. ☐ (a) and (b)
9. A quantity of pure water of temperature  $3^\circ\text{C}$  is placed in a refrigerator.

What happens to the mass and volume of the water when it freezes?.....

|                          | Water mass     | Water volume |
|--------------------------|----------------|--------------|
| a. <input type="radio"/> | Increases      | Increases    |
| b. <input type="radio"/> | Doesn't change | Increases    |
| c. <input type="radio"/> | Decreases      | Increases    |
| d. <input type="radio"/> | Doesn't change | Decreases    |



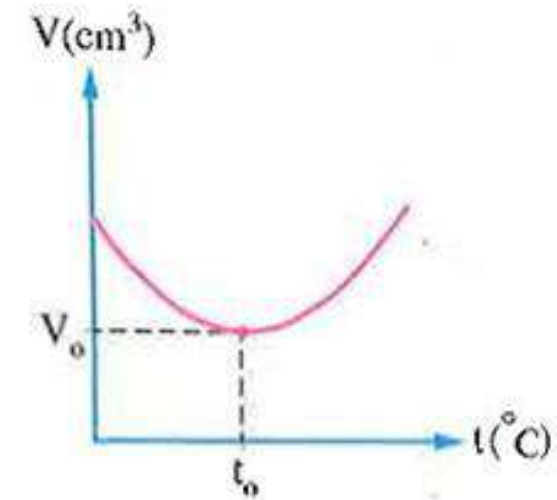
10. The opposite graph represents the relation between the volume ( $V$ ) of a quantity of pure water of mass 2 g and its temperature ( $t$ ), so :

1. The value of ( $t_0$ ) on the graph equals.....

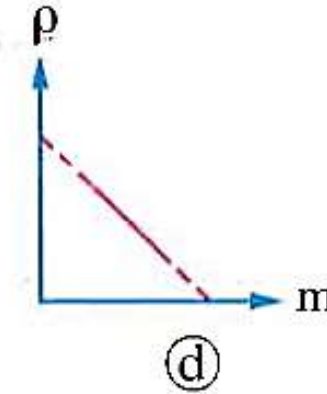
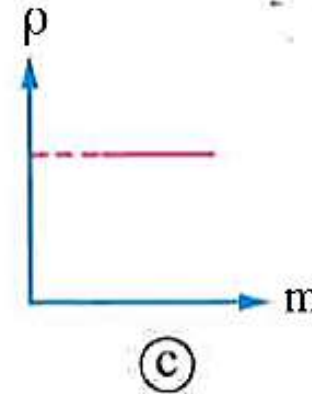
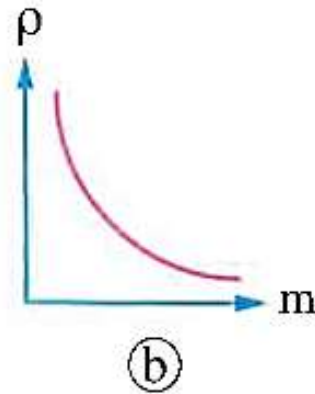
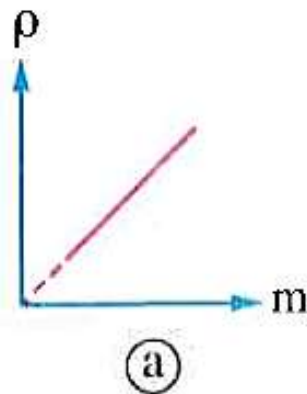
- a.  $0\ 2^{\circ}\text{C}$
- b.  $0\ 4^{\circ}\text{C}$
- c.  $0\ 8^{\circ}\text{C}$
- d.  $0\ 10^{\circ}\text{C}$

2. The value of ( $V_0$ ) on the graph equals.....

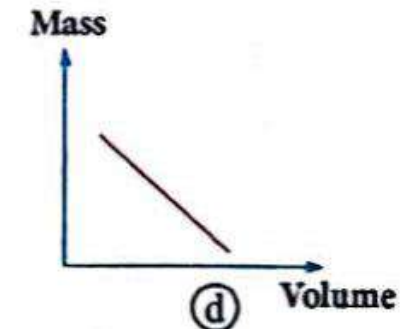
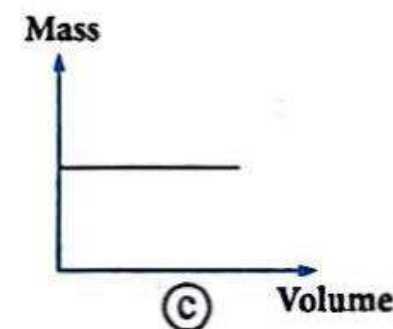
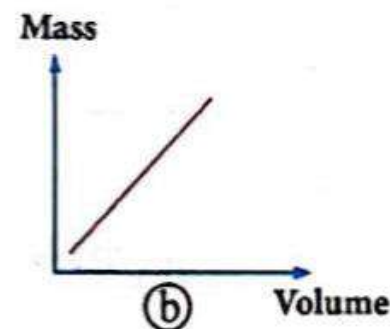
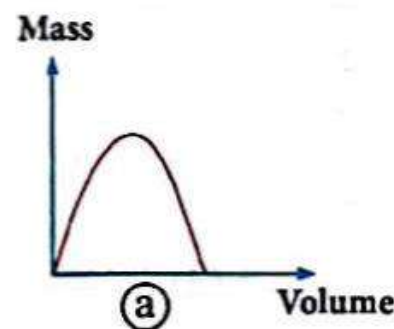
- a.  $0\ 0.99\ \text{cm}^3$
- b.  $0\ 1\ \text{cm}^3$
- c.  $0\ 1.9\ \text{cm}^3$
- d.  $0\ 2\ \text{cm}^3$



11. The graph that represents the relationship between density ( $\rho$ ) of pure water and mass ( $m$ ) of samples from it at a temperature of  $50^{\circ}\text{C}$  is .....

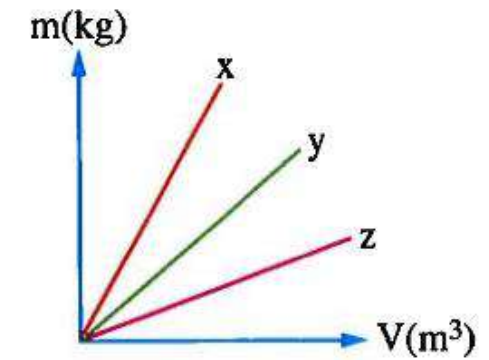


12. Which of the following graphs represents the relation between the mass of a liquid and its volume, assuming constant temperature?.....

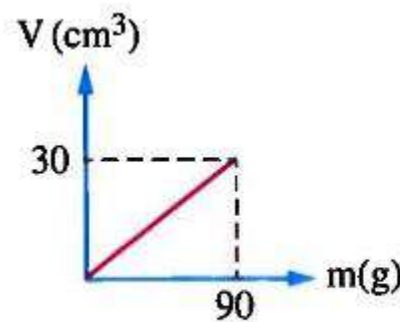


13. The opposite graph represents the relation between the mass ( $m$ ) and the volume ( $V$ ) for different samples that are taken from three liquids. (x), (y) and (z), so the correct order for the density of the three liquids is .

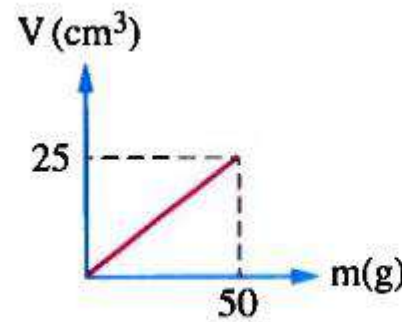
- a.  $\rho_x < \rho_y < \rho_z$
- b.  $\rho_x = \rho_x = \rho_x$
- c.  $\rho_x > \rho_x > \rho_x$
- d.  $\rho_x < \rho_x > \rho_x$



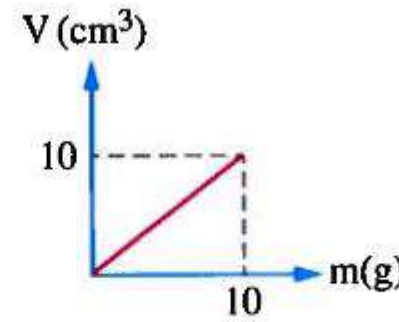
14. Which of the following graphs represents the relation between the volume ( $V$ ) in  $\text{cm}^3$  and the mass ( $m$ ) in grams for samples of pure water of density equals  $1000 \text{ kg/m}^3$ ?.....



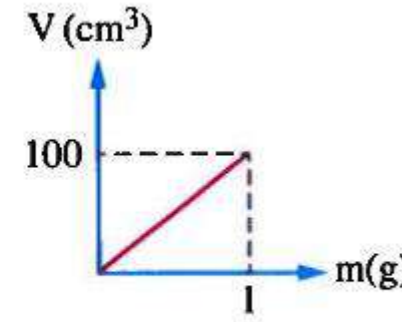
(a)



(b)



(c)



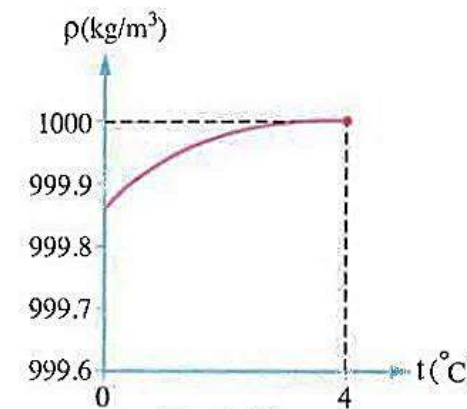
(d)

15. Graph (1) shows the relation between density ( $\rho$ ) of pure water and its temperature ( $t$ ) on the Celsius scale.

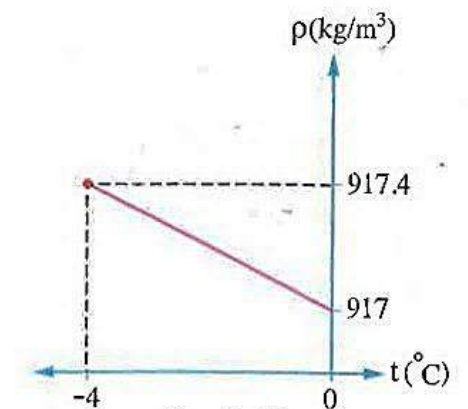
Graph (2) represents the same relationship for ice.

By studying the two graphs, the density of ice at  $0^\circ\text{C}$  is.....

- a.  $\rho$  equal to the density of liquid water at  $0^\circ\text{C}$
- b.  $\rho$  greater than the density of liquid water at  $0^\circ\text{C}$
- c.  $\rho$  less than the density of liquid water at  $0^\circ\text{C}$
- d.  $\rho$  indeterminable



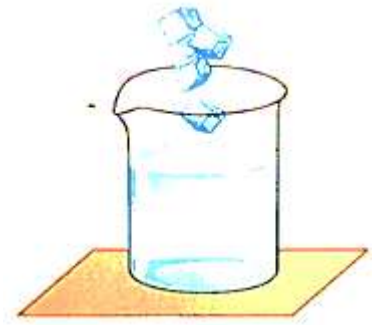
Graph (1)



Graph (2)



16. Ice cubes formed from pure water are added to a container of pure water at  $4^{\circ}\text{C}$ , as shown in the opposite figure. What happens to the density of the water during the melting of ice?.....

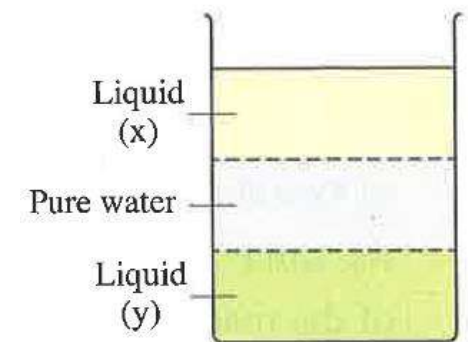


- a. ☐ Increases
  - b. ☐ Decreases
  - c. ☐ Remains unchanged
  - d. ☐ Cannot be determined
17. Liquid at a specific temperature was poured into a cylindrical container until its level reached the middle of the container. The density of the liquid was ( $\rho$ ), if more of the same liquid is poured at the same temperature to completely fill the container, the density of the liquid will be equal to.....

- a. ☐  $\frac{1}{2} \rho$
- b. ☐  $2 \rho$
- c. ☐  $\frac{3}{2} \rho$
- d. ☐  $\rho$

18. The opposite figure shows three immiscible liquids in one container. So, the ratio between the density of liquid (x) and that of liquid (y) is.....

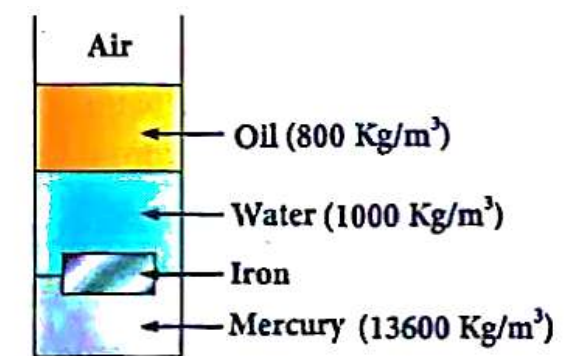
- a. ☐ more than 1
- b. ☐ less than 1
- c. ☐ equal to 1
- d. ☐ indeterminable



19. The opposite figure shows several immiscible liquids of known density that are settled inside a container, when a piece of iron was dropped into the container, it suspended as shown in the figure

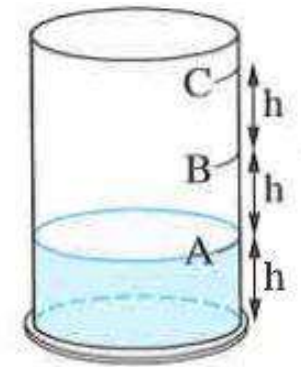
The density of iron can be.....( $\text{Kg}/\text{m}^3$ )

- a. ☐ 600
- b. ☐ 8000
- c. ☐ 1000
- d. ☐ 14000



20. The opposite figure shows a container with an amount of liquid (X) of relative density (2) with a mass (m). If an amount of liquid (Y) with a mass (m) of relative density (1) is added to the container and does not mix with the first liquid

The surface level of liquid Y will settle.....

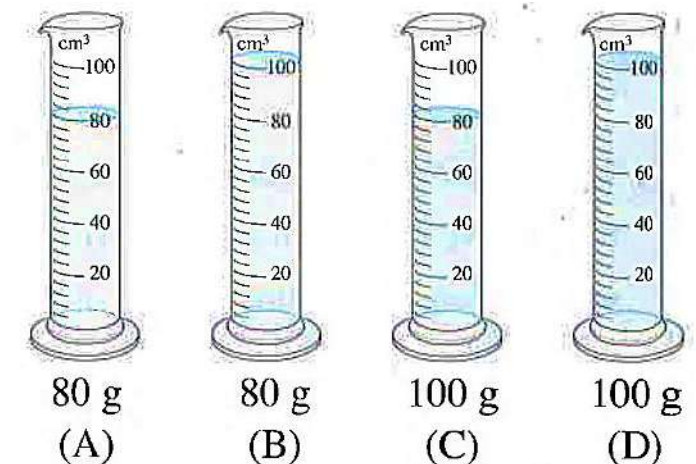


- a. ☐ at level B
  - b. ☐ between levels A and B
  - c. ☐ at level C
  - d. ☐ between levels B and C
21. The candle floats on the surface of water, while it sinks in alcohol. This is explained by.....
- a. ☐ The candle has a greater mass in alcohol
  - b. ☐ The mass of water is less than the mass of alcohol
  - c. ☐ The density of water is greater than the density of alcohol
  - d. ☐ All of the above are possible

22. The opposite figure shows four graduated cylinders A, B, C and D, each containing a liquid where the mass of each liquid is shown below its cylinder.

All the cylinders are in the same room at a temperature of  $25^{\circ}\text{C}$ , so the two cylinders that contain the same liquid are.....

- a. ☐ A and D
  - b. ☐ A and C
  - c. ☐ B and C
  - d. ☐ B and D
23. The lead balls in the hydrometer :.....
- a. ☐ is the reason for the immersed part of the hydrometer
  - b. ☐ react with the substance to be measured
  - c. ☐ balance with temperature of the liquid
  - d. ☐ helps floating of the hydrometer





1<sup>st</sup> Secondary

Integrated Sciences

الفصل الدراسي الأول

الدرس - الرابع -

Properties of Aqueous Solutions

- الإختبار -

**First : Choose the correct answer :**

---

1. **The aquatic environment for marine organisms is.....**

- a. ☐ homogeneous mixture, in which water is the solvent
- b. ☐ A heterogeneous mixture, in which water is the solvent
- c. ☐ homogeneous mixture, in which water is the solute
- d. ☐ A heterogeneous mixture, in which water is the solute

2. **Which of the following properties is not considered a colligative property of water?..**

- a. ☐ Vapor pressure of the liquid
- b. ☐ Osmotic pressure
- c. ☐ Boiling point
- d. ☐ Specific heat capacity

3. **When does the liquid reach the dynamic equilibrium state?.....**

- a. ☐ When the evaporation rate is higher than the condensation rate
- b. ☐ When the evaporation rate is equal to the condensation rate
- c. ☐ When the condensation rate is greater than the evaporation rate
- d. ☐ When evaporation continues and condensation vanishes

4. **What happens to vapor pressure of the liquid when its temperature increases?.....**

- a. ☐ Increases
- b. ☐ Decreases
- c. ☐ Not affected
- d. ☐ Becomes zero

5. **What is the relationship between the number of solute molecules in a solution and its vapor pressure?..**

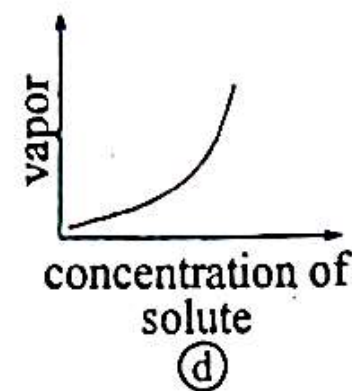
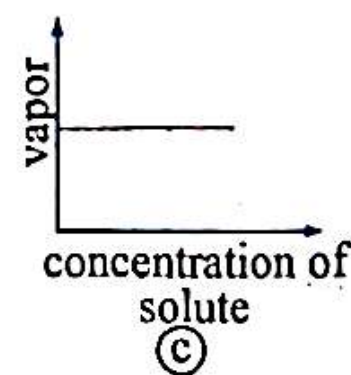
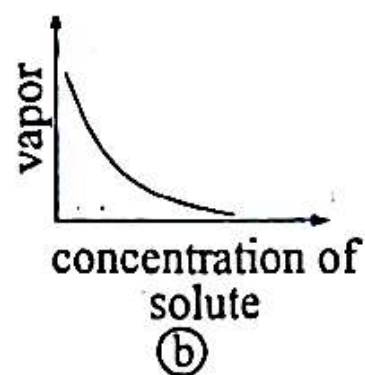
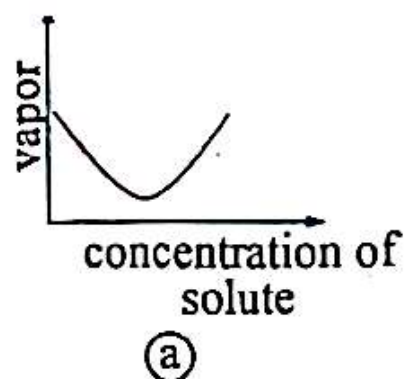
- a. ☐ Inverse relationship
- b. ☐ Direct relationship
- c. ☐ No relationship
- d. ☐ Variable relationship

6. **What is the relation between the decrease in the vapor pressure of a solution and the number of solute ions in the solution?.....**

- a. ☐ Inverse
- b. ☐ Direct
- c. ☐ Constant
- d. ☐ Increasing then decreasing



7. Which of the following graphs represents the relation between the concentration of solute ions in the solution and the vapor pressure of the liquid?.....



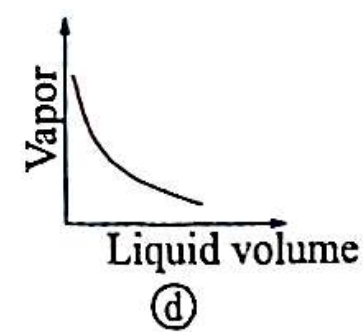
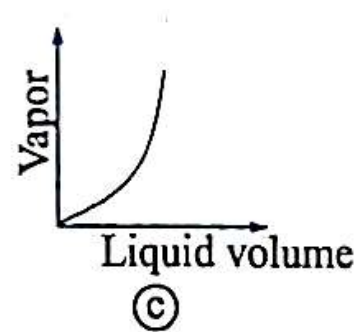
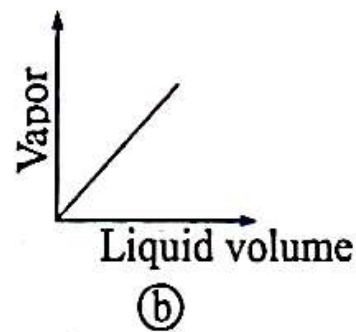
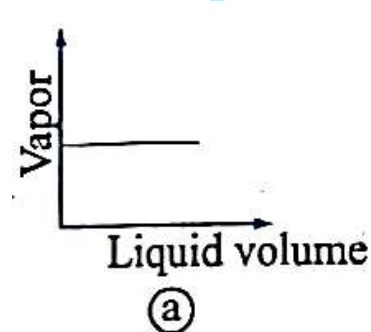
8. What are the consequences of using salt or sugar in preserving some beverages?.....

- a. ☐ Increasing the liquid vapor pressure
- b. ☐ Improving the taste only
- c. ☐ Decreasing the liquid vapor pressure
- d. ☐ Decreasing the liquid boiling point

9. The following solutions have equal concentrations, which of them has the least vapor pressure?.....

- a. ☐ NaCl
- b. ☐  $\text{CuCl}_2$
- c. ☐  $\text{Al}(\text{NO}_3)_3$
- d. ☐ HCl

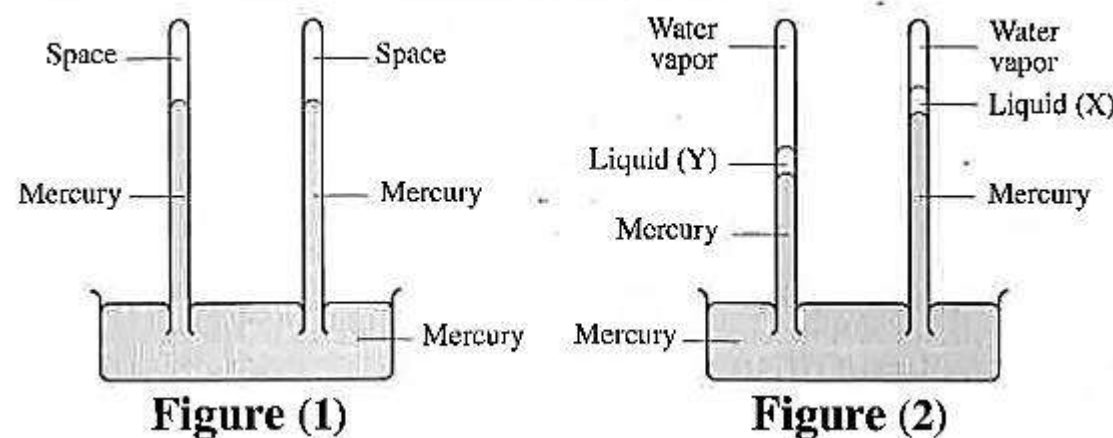
10. Which of the following graphs correctly represents the relation between the volume of a liquid and its vapor pressure at constant temperature?.....



11. What happens to the vapor pressure of a pure liquid in a closed container when the amount of liquid is doubled at the same temperature?.....

- a. ☐ It increases
- b. ☐ It decreases
- c. ☐ It remains constant
- d. ☐ It increases or decreases according to liquid type

12. In the two opposite figures, two solutions (X and Y) of an equal volume were put in two tubes each separately, as the illustrated apparatus in figure (1). Mercury level in the two tubes decreases as in figure (2).



Which of the following is correct?.....

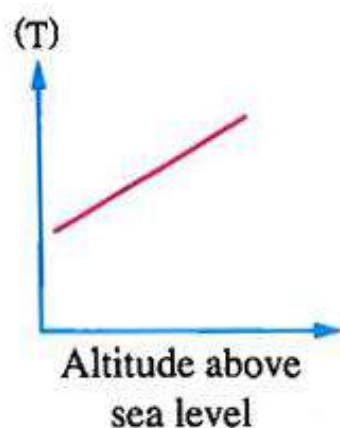
- O (X) represents distilled water, (Y) represents NaCl solution
  - O (X) represents Nile River, (Y) represents seawater
  - O (X) represents NaCl solution, (Y) represents distilled water
  - O (X) represents distilled water, (Y) represents ocean water
13. Liquid starts to boil when its vapor pressure is.....
- O less than pressure exerted on it
  - O greater than pressure exerted on it
  - O equal to pressure exerted on it
  - O double the pressure exerted on it
14. At standard atmospheric pressure, if the boiling point of a pure solvent =  $X^{\circ}\text{C}$ , therefore the boiling point of solution formed from dissolving one of its salts in it, is.....
- O equal to X
  - O larger than X
  - O less than X
  - O equal to 2

15. At higher altitudes above sea level, which of the following is correct about the boiling point of pure water?..

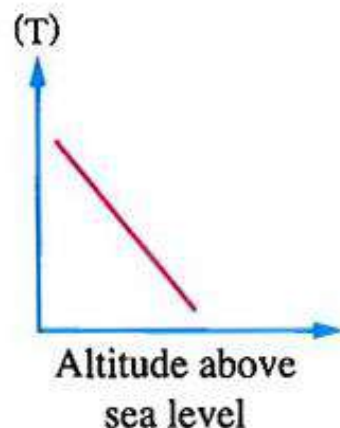
- O It decreases as the atmospheric pressure increases
- O It decreases as the atmospheric pressure decreases
- O It increases as the atmospheric pressure decreases
- O It increases as the atmospheric pressure increases



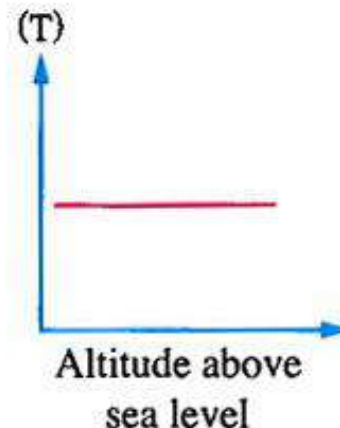
16. Which of the following graphs represents the relation between the boiling point of pure water (T) and the altitude above sea level?.....



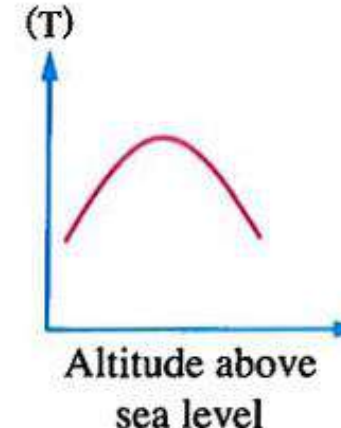
(a)



(b)



(c)



(d)

17. If the boiling point of a solution at a mountaintop is  $108^{\circ}\text{C}$ , therefore the boiling point of the same solution on the Earth's surface is....

a.  $106^{\circ}\text{C}$

b.  $104^{\circ}\text{C}$

c.  $108^{\circ}\text{C}$

d.  $110^{\circ}\text{C}$

18. Assuming that a liquid boils at  $90^{\circ}\text{C}$ , if it is exposed to high pressure, its boiling point can be.....

a.  $82^{\circ}\text{C}$

b.  $90^{\circ}\text{C}$

c.  $110^{\circ}\text{C}$

d.  $70^{\circ}\text{C}$

19. The boiling point of pure water inside the pressure-cooking pot may be.....

a.  $125^{\circ}\text{C}$

b.  $90^{\circ}\text{C}$

c.  $100^{\circ}\text{C}$

d.  $80^{\circ}\text{C}$

20. The boiling point of a liquid inside the pressure-cooking pot is.....its boiling point at atmospheric pressure of  $0.5\text{ atm}$ .

a.  $\text{O}$  greater than

b.  $\text{O}$  less than

c.  $\text{O}$  equal to

d.  $\text{O}$  half

1<sup>st</sup> Secondary

## Integrated Sciences

الفصل الدراسي الأول

الدرس - الخامس -

Biological Importance of Water

- الإختبار -



**First : Choose the correct answer :**

---

1. Which of the following describes the structure of prokaryotic cells?.....
  - a. ☐ Simple with two cells
  - b. ☐ Complex with many cells
  - c. ☐ Simple with one cell
  - d. ☐ Simple with three cells
2. A bacterium is classified as a prokaryote, because it-----
  - a. ☐ has cilia
  - b. ☐ has no membrane-bound nucleus
  - c. ☐ is a single cell
  - d. ☐ has no DNA
3. Put the following structures in the order in which are organized in the human body, from smallest to largest?..  
(Tissues, cells, organ systems, organs)
  - a. ☐ Cells → organs → tissues → organ systems
  - b. ☐ Cells → tissues → organs → organ systems
  - c. ☐ Tissues → organs → organ systems → cells
  - d. ☐ Organ systems → organs → tissues → cells
4. If the nuclear membrane is removed from a eukaryotic cell, the cell with this feature will resemble that of ...
  - a. ☐ bacteria
  - b. ☐ fungi
  - c. ☐ protists
  - d. ☐ multicellular algae
5. If a living organism has its genetic material is free in the cytoplasm and lacks mitochondria, then this organism is a/an ...
  - a. ☐ prokaryote
  - b. ☐ plant
  - c. ☐ eukaryote
  - d. ☐ animal
6. Fungi and protozoa are similar in that all of them....
  - a. ☐ contain cell wall
  - b. ☐ are heterotrophic
  - c. ☐ are aquatic
  - d. ☐ are unicellular
7. Which of the following is true about the Kingdom Fungi?....
  - a. ☐ Most fungi are heterotrophic
  - b. ☐ Most fungi perform photosynthesis
  - c. ☐ All fungi are multicellular
  - d. ☐ All fungi have a plasma membrane

8. All the following are heterotrophic organisms, except.....

- a. **O** Protozoa                      b. **O** yeast fungus                      c. **O** golden algae                      d. **O** starfish

9. Which of the following organisms is unicellular and does not contain a nuclear membrane?...

- a. **O** Amoeba                      b. **O** Yeast                      c. **O** Euglena                      d. **O** Bacteria

10. All the following are from vertebrates, except.....

- a. **O** fish                      b. **O** amphibians                      c. **O** reptiles                      d. **O** arthropods

11. Which of the following substances determines the shape of the corn plant cell?.....

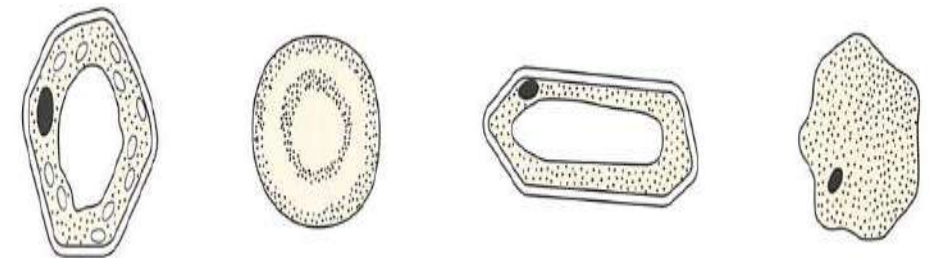
- a. ☐ Peptidoglycan and cellulose  
b. ☐ Lipids only  
c. ☐ Chitin and protein  
d. ☐ Cellulose only

12. Which cell structure plays the primary role in selective permeability?.....

- a. ☐ Chloroplast      b. ☐ Plasma membrane      c. ☐ Cell wall      d. ☐ Mitochondria

13. Which of the following all the cells are similar in its presence?.....

- a. ☐ Cell membrane  
b. ☐ Cell wall  
c. ☐ Plastids  
d. ☐ Nucleus



14. Which of the following structures contains genes?.....

- a. ☐ Plasma membrane of a plant cell  
b. ☐ Cytoplasm of an animal cell  
c. ☐ Nucleus of a plant cell  
d. ☐ Lysosome in an animal cell

15. In which does the nucleus in an animal cell differ from the nucleus in a plant cell?.....

- a. ☐ Its location in the cell
- b. ☐ containing genetic material
- c. ☐ Its structure
- d. ☐ Its function



16. All eukaryotes are similar in containing.....

- a. ☐ large vacuole
- b. ☐ mitochondria
- c. ☐ cell wall
- d. ☐ chloroplasts

17. Which of the following do you expect its/their presence is abundant in the birds' muscular cells?....

- a. ☐ Endoplasmic reticulum
- b. ☐ Plasma membrane
- c. ☐ Mitochondria
- d. ☐ Vacuoles

18. Which of the following are found in both of a human skin cell and a cell of a corn plant leaf?.....

- a. ☐ Nucleus and cytoplasm
- b. ☐ Plasma membrane and large vacuole
- c. ☐ Nucleus and plastid
- d. ☐ Plasma membrane and cell wall

19. What distinguishes a Salmonella cell from a human stomach cell?.....

- a. ☐ The presence of mitochondria
- b. ☐ The presence of a cell membrane
- c. ☐ The presence of a nuclear membrane
- d. ☐ The presence of a cell wall

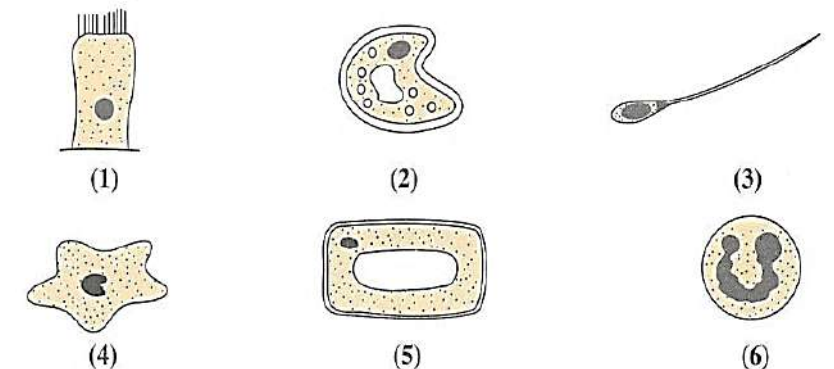
20. Dysfunction of mitochondria in the cell directly leads to ...

- a. ☐ cessation of protein synthesis
- b. ☐ reduction of ATP production
- c. ☐ failure of cell division
- d. ☐ cessation of transpiration maintain

21. The following figures illustrate 6 cells :

Which of the them are plant cells and which of them are animal cells?...

|    | Plant cells         | Animal cells        |
|----|---------------------|---------------------|
| a. | (2), (3) & (4)      | (1), (5) & (6)      |
| b. | (1), (3), (5) & (6) | (2) & (4)           |
| c. | (2) & (5)           | (1), (3), (4) & (6) |
| d. | (1). (4) & (6)      | (2), (3) & (5)      |

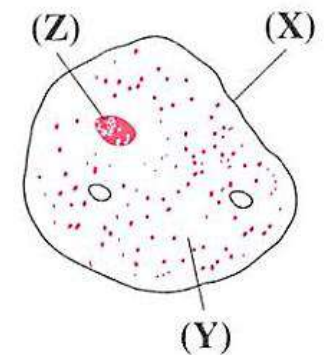


22. A cell has the following molecules and structures: enzymes, DNA, plasma membrane, and mitochondria. It could be a cell from.....

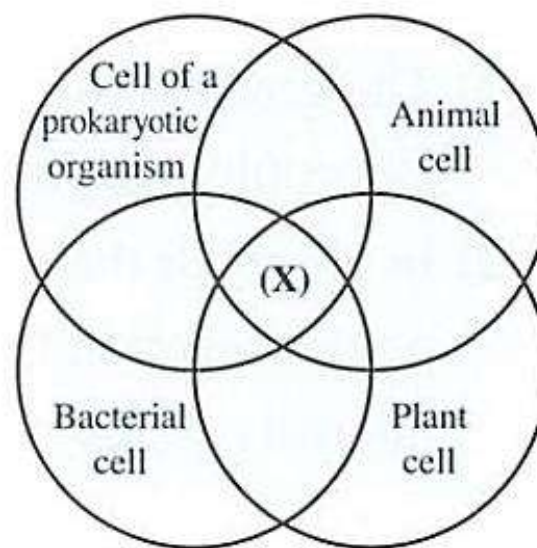
- a. ☐ a bacterium
- b. ☐ an animal, but not a plant
- c. ☐ a plant, but not an animal
- d. ☐ a plant or an animal

23. Which of the following is correct according to structures (X), (Y) and (Z) that are found in the plant cell?.....

|                          | (X) | (Y) | (Z) | ✓ | Present |
|--------------------------|-----|-----|-----|---|---------|
| a. <input type="radio"/> | ✓   | ✓   | ✓   | ✗ | Absent  |
| b. <input type="radio"/> | ✗   | ✗   | ✓   |   |         |
| c. <input type="radio"/> | ✓   | ✓   | ✗   |   |         |
| d. <input type="radio"/> | ✗   | ✓   | ✗   |   |         |



24. The opposite diagram illustrates four different cells.



What is the structure that is represented by symbol (X)?.....

- a. ☐ Cell membrane
- b. ☐ Cell wall
- c. ☐ Chloroplast
- d. ☐ Nuclear membrane



25. The figure in front of you illustrates an animal cell, study it, then answer.

1. Which of the following structures whose number decreases in the plant cell?.....

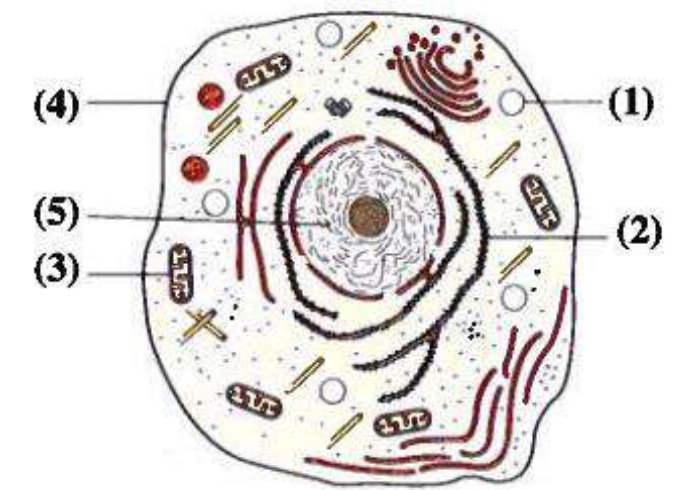
- |          |          |
|----------|----------|
| a. O (1) | c. O (2) |
| b. O (4) | d. O (5) |

2. Which of the following structures consists of a group of membranes?.....

- |          |          |
|----------|----------|
| a. O (1) | c. O (3) |
| b. O (2) | d. O (4) |

3. Which of the following structures controls the living cell activities?.....

- |          |          |
|----------|----------|
| a. O (1) | c. O (3) |
| b. O (2) | d. O (5) |



26. The following figure represents a bacterial cell that lives in liquid media as water and milk, using the flagella illustrated in the figure for movement.

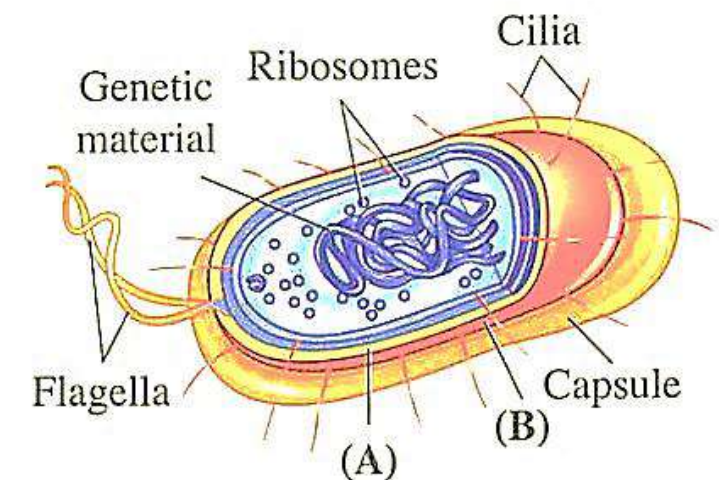
Study it, then answer :

1. What is the function of structure (A)?.....

- a. O It acts on supporting the bacterial cell
- b. O It allows the passage of water and dissolved substances through it easily
- c. O It regulates the passage of substances from and to the cell
- d. O It is found in the bacterial and plant cells only

2. What is the function of structure (B)?.....

- a. O It acts on supporting the bacterial cell
- b. O It allows the passage of water and doesn't allow the passage of dissolved substances through it
- c. O It regulates the passage of substances from and to the cell
- d. O It exists in all the living cells



# كيفية طباعة صفحات معينة من ملف معين

## مثلا ازاي نطبع الصفحات من صفحة 4 الى صفحة 9

